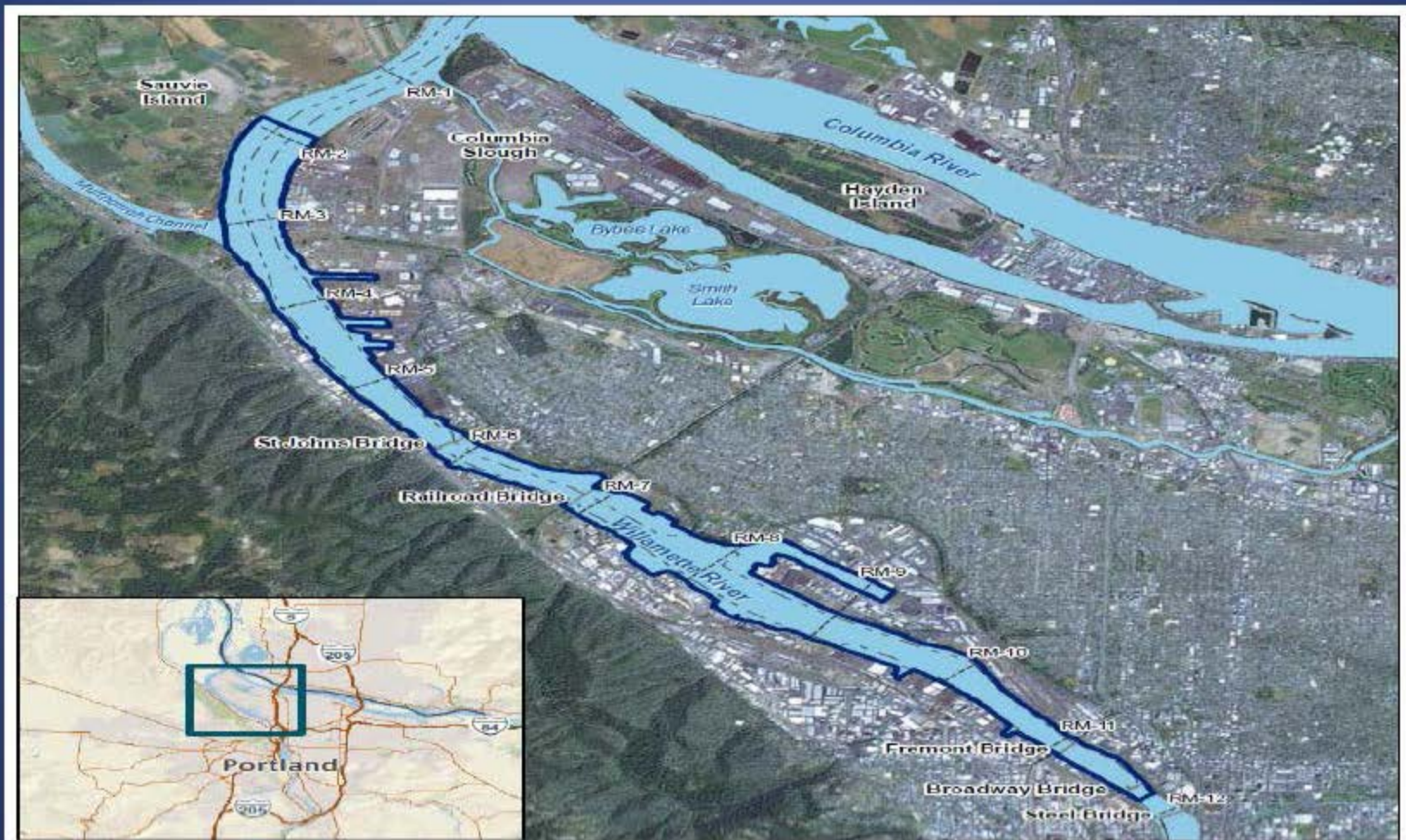


Portland Harbor

CSTAG Update
June 2013



Portland Harbor Superfund Site



Portland Harbor Superfund Site

- Listed in 2000 as Superfund Site
- U.S. EPA and Oregon DEQ oversight (with multiple federal and state agencies and Tribal governments)
- Lower Willamette Group – 12 companies and 2 public agencies funding cleanup studies. Ten parties signed the AOC

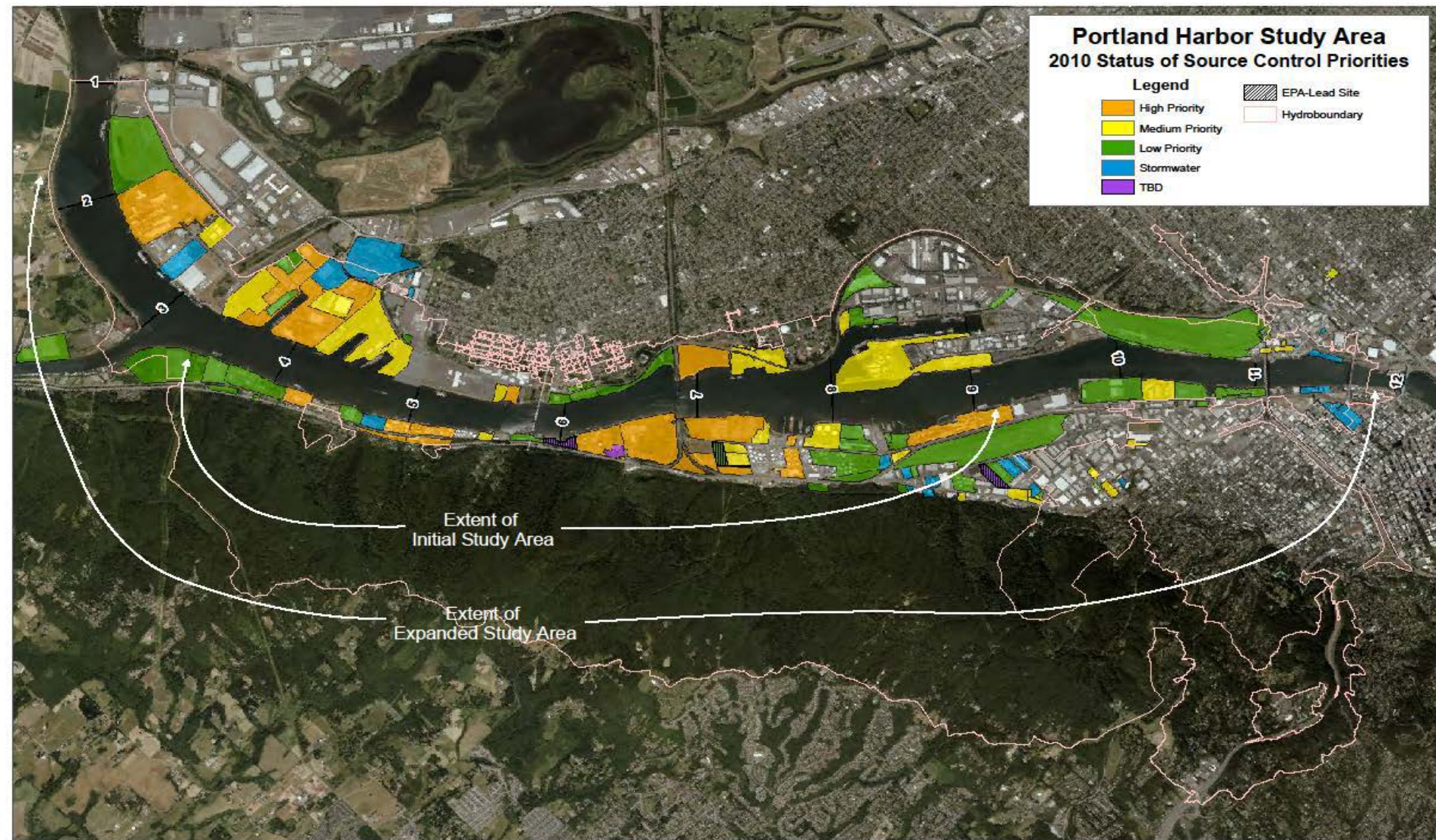
Site Background

- Over 100 years of industrial activity
- Many types of industries and contaminants:
 - Ship construction and maintenance (metals, TBT, PCBs)
 - Chemical manufacturing (pesticides, dioxins, perchlorate, Cr VI)
 - Wood treating (PAHs, PCP, metals)
 - Bulk petroleum storage (PAHs)
 - Manufactured Gas Plant (PAHs, Cyanide)
 - Rail Road Yards (PAHs)
 - Metals production, fabrication and recycling (metals, PCBs)
 - Industrial and urban Stormwater (metals, PCBs, phthalates, pesticides)

Portland Harbor Challenges

- Large site at bottom of large watershed
- Dynamic river system
- Large number of sources and source types
- Large number of PRPs and MOU partners
- Regulatory complexity - ESA listed receptors
- Integration of RI/FS with source control, early actions and NRDA, WQ authorities and USACE
- Background contamination may prevent achievement of some RAOs
- Managing uncertainty, political interest

Upland Source Control



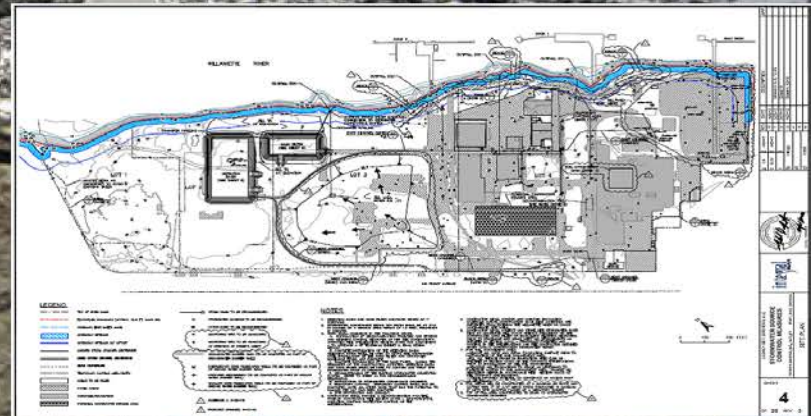
DEQ Source Control program

- Total Sites in Program = 100
- Closed Sites = 28
- Continuing Work = 72
 - High Priority = 14
 - Medium Priority = 29
 - Low Priority = 28
 - TBD = 1

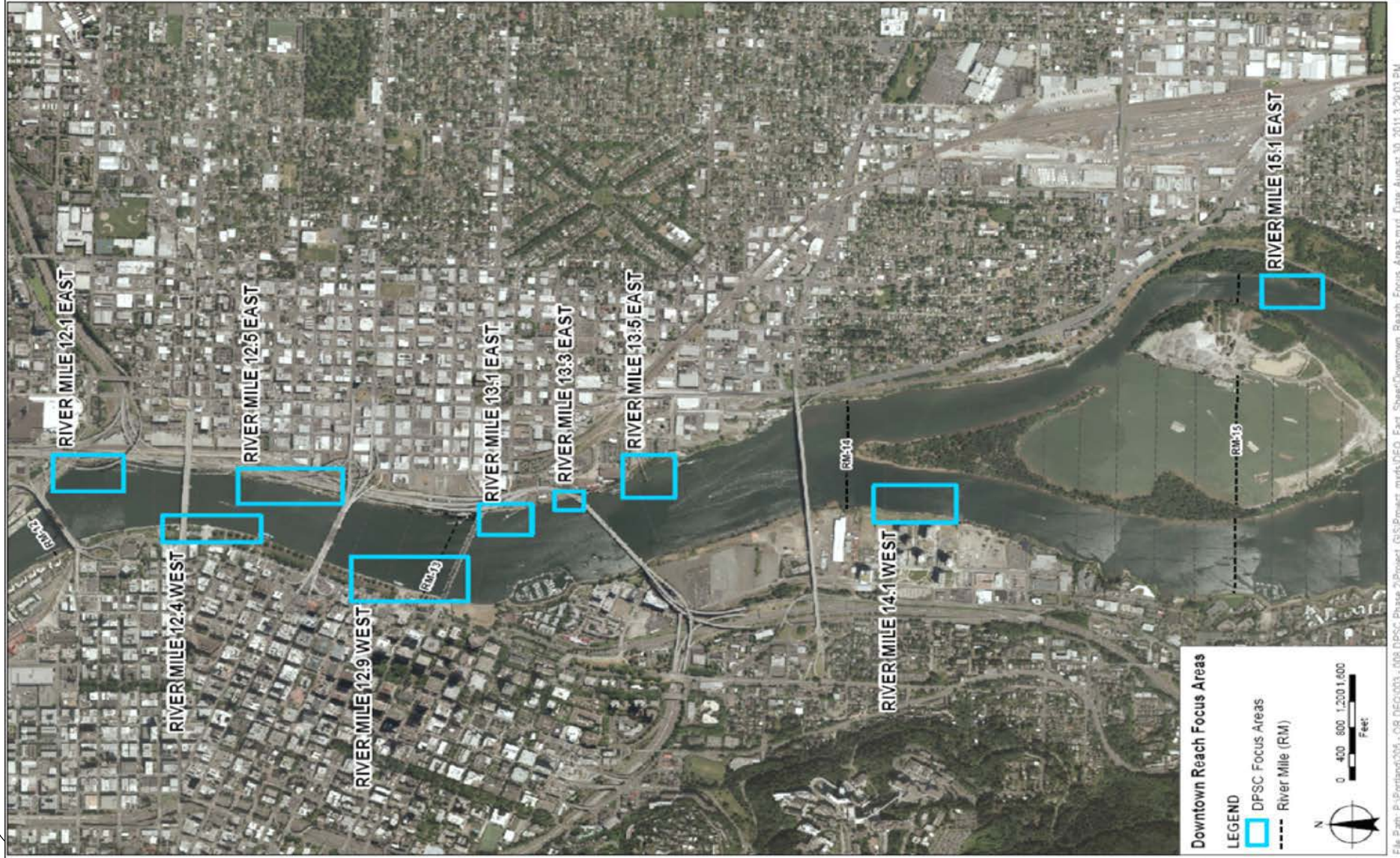
Source Control Sites Status

- High Priority Sites
 - Interim or final SCMs have been selected and implemented at 12 of 13 sites
 - Six sites have effective ground-water SCMs operating
 - Ground-water SCMs being installed at Gasco and Arkema sites in 2012-13
- Medium Priority Sites
- Goal - SCEs completed by 12/13
 - 17 of 29 medium-priority sites have SCEs
 - 22 sites have interim SCMs in place
 - 11 sites to have SCEs completed in 2013
- SCEs completed 12/13
 - 10 of 28 low-priority sites have SCEs
 - 15 low-priority sites have interim SCMs in place
 - 15 low-priority sites to have SCEs completed in 2013

Arkema Slurry Wall



Upstream Source Control



Zidell – upland cleanup, riverbank and sediment cap of PCB source area

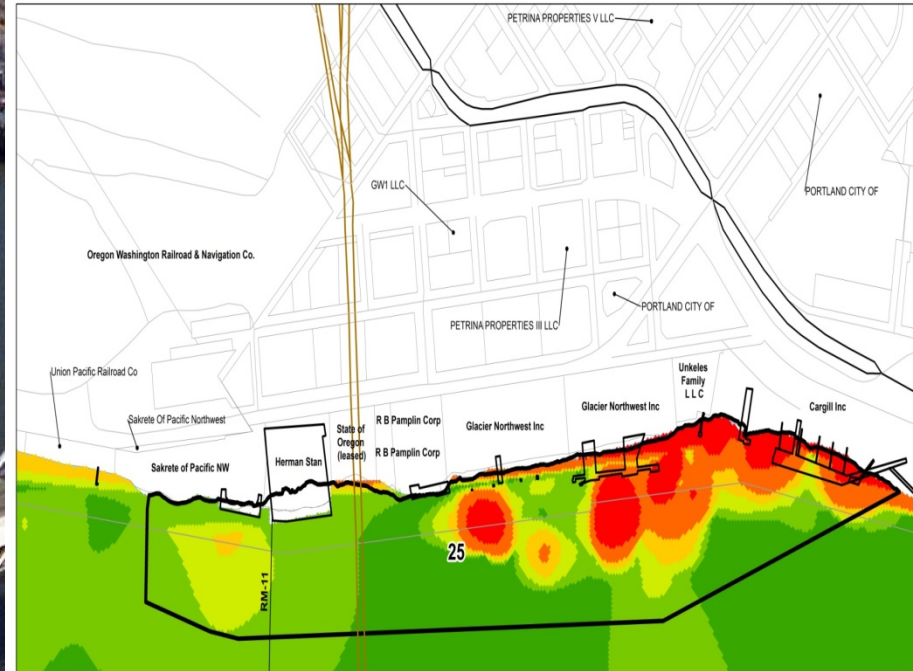


Portland Harbor Area Early Actions

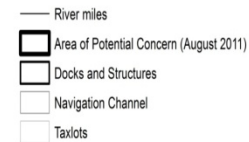
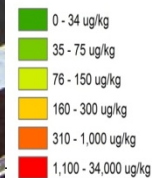
- Address hot spots and facilitate overall sequencing of harbor-wide work
- GASCO: PAHs
 - Phase 1 Early action completed in 2005
 - Phase II work to be integrated with in-water FS
 - Phase II work will likely be performed post-ROD
- Terminal 4: PAHs
 - Partial abatement completed at T4
 - Phase II of early action may be completed post-ROD
- Arkema: DDx
 - Disputes resolved sufficient to allow EECA sampling
 - Working to integrate in-water RI/FS with early actions
- RM 11E: PCB
 - Early Action Agreement 2012



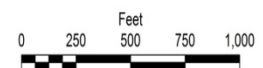
RM 11E



Legend



Sediment Surface PCB Distribution

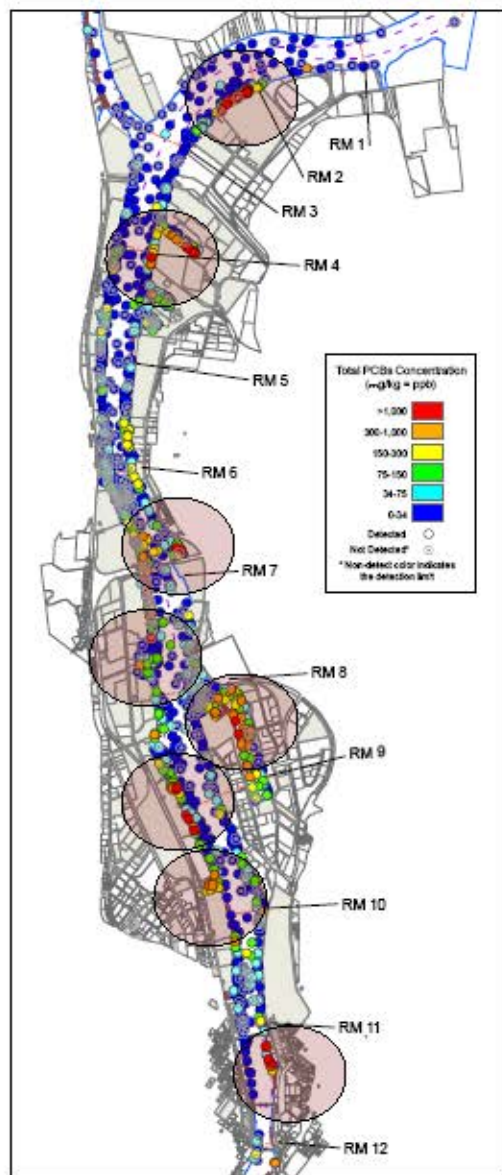


RI/FS – Current Status

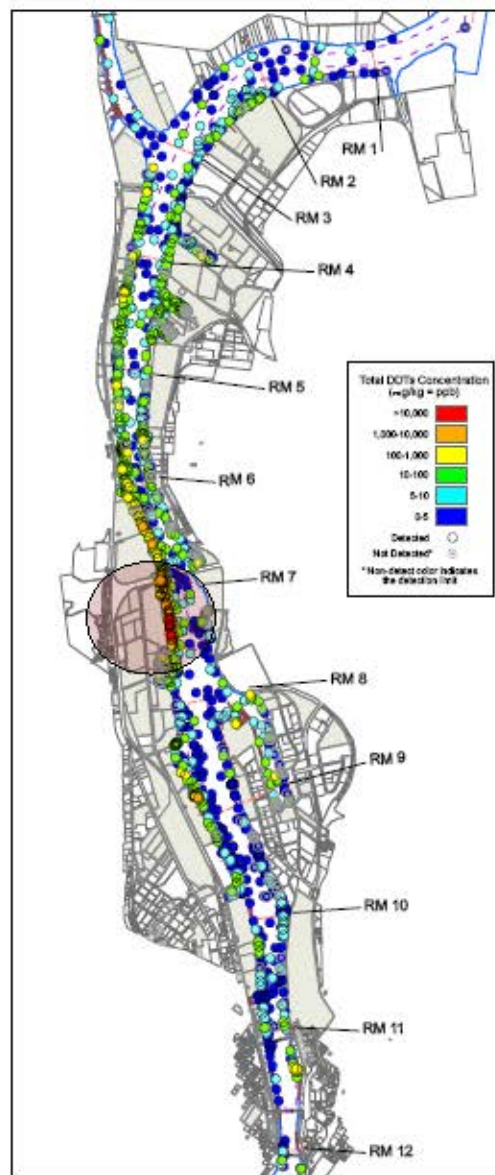
- Final baseline human health assessment approved April 2013 (formal dispute)
- Final baseline ecological risk assessment due June 20th, EPA expects to approve by end of June 2013
- Draft RI Report July 2011 – review completed Dec 2011- EPA modifying document, targeted for Oct 2013
- Draft FS Report submitted March 30, 2012 (15K pages) EPA initial comments December 2012

Draft RI Conclusions

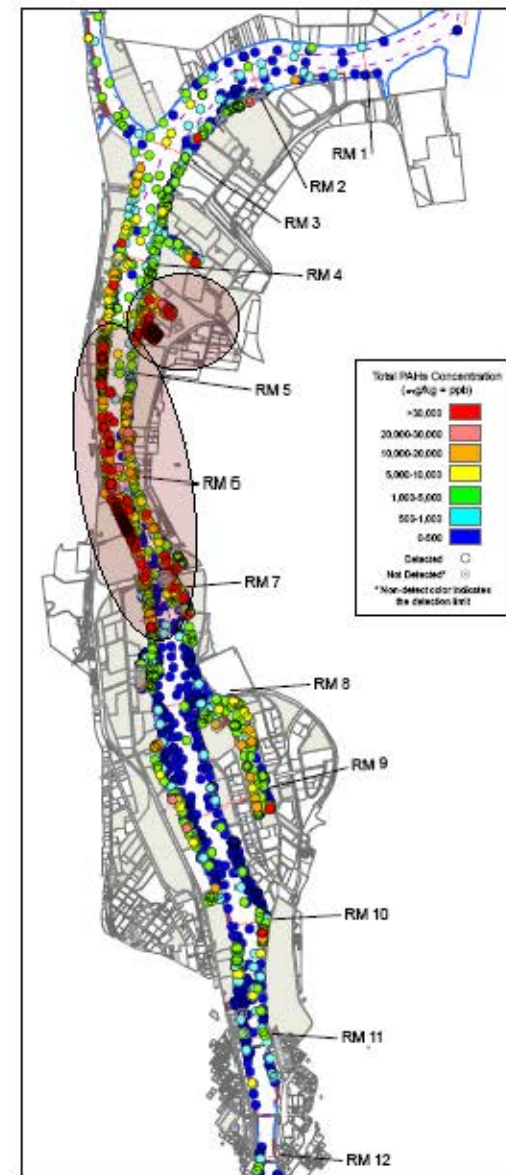
- RI data demonstrates relationship between sediment, surface water, tissue and upland sources
 - Chemical concentrations are higher in near shore areas and deeper sediments
 - Ongoing sources of contamination still exist throughout study area (e.g., stormwater, groundwater, bank erosion)
- Highest levels of contamination in 9 major areas
- RM 5-7
 - Significant ongoing sources
 - NAPL



Total PCBs

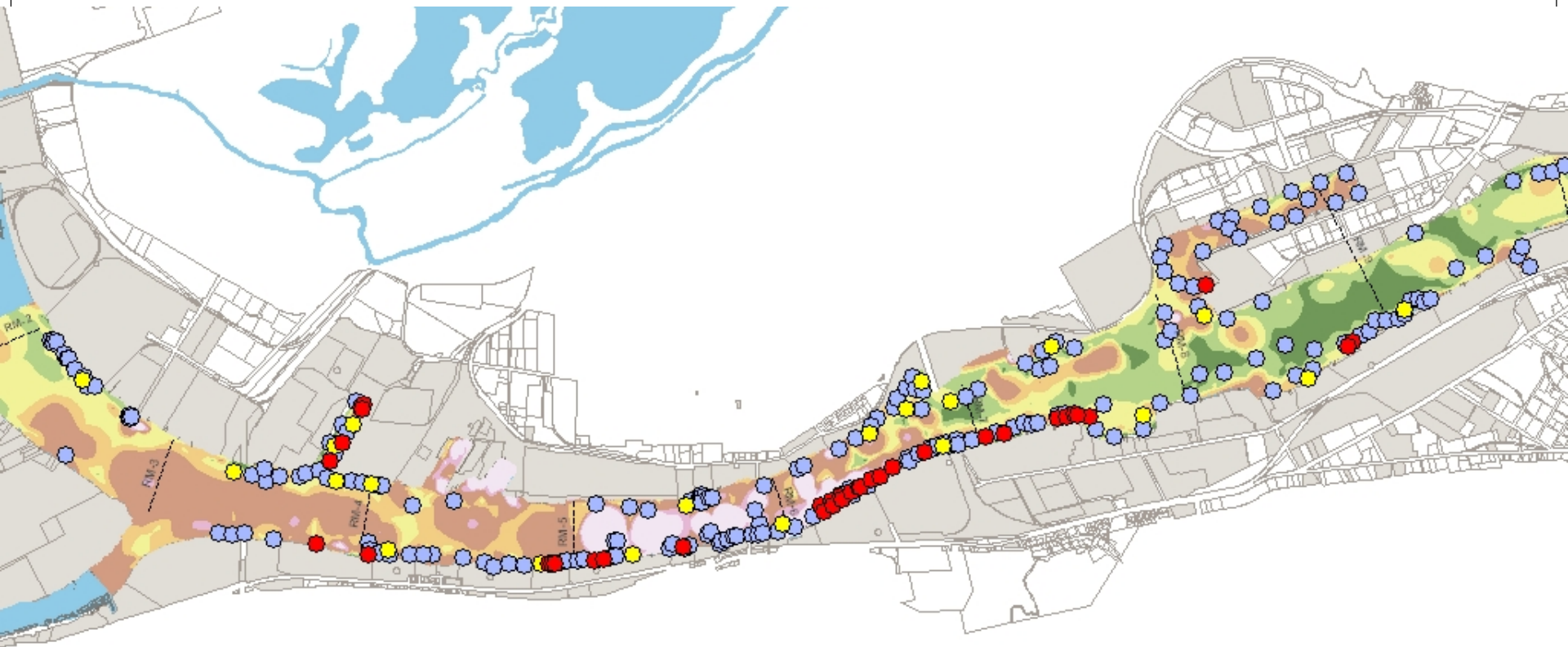


Total DDTs

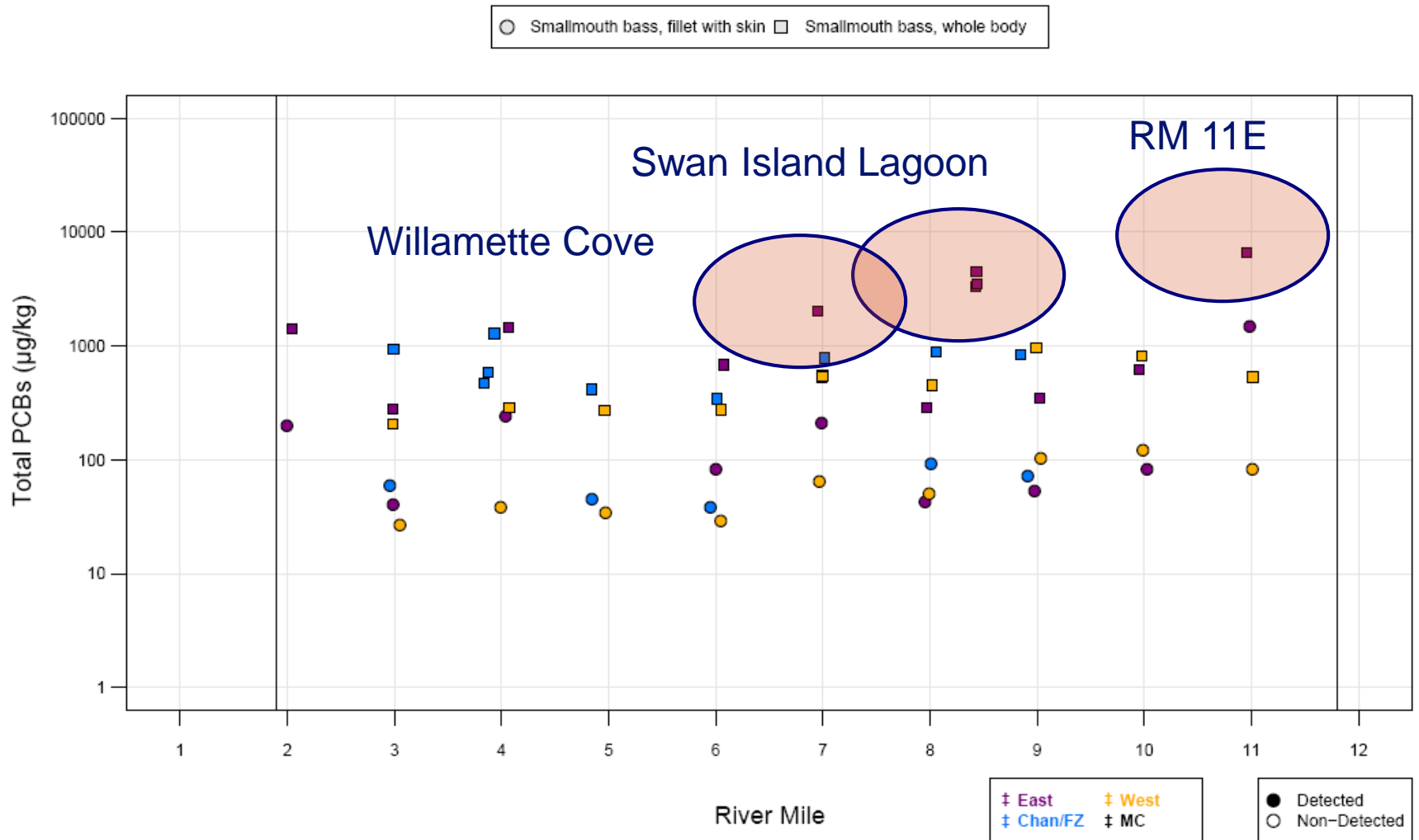


Total PAHs

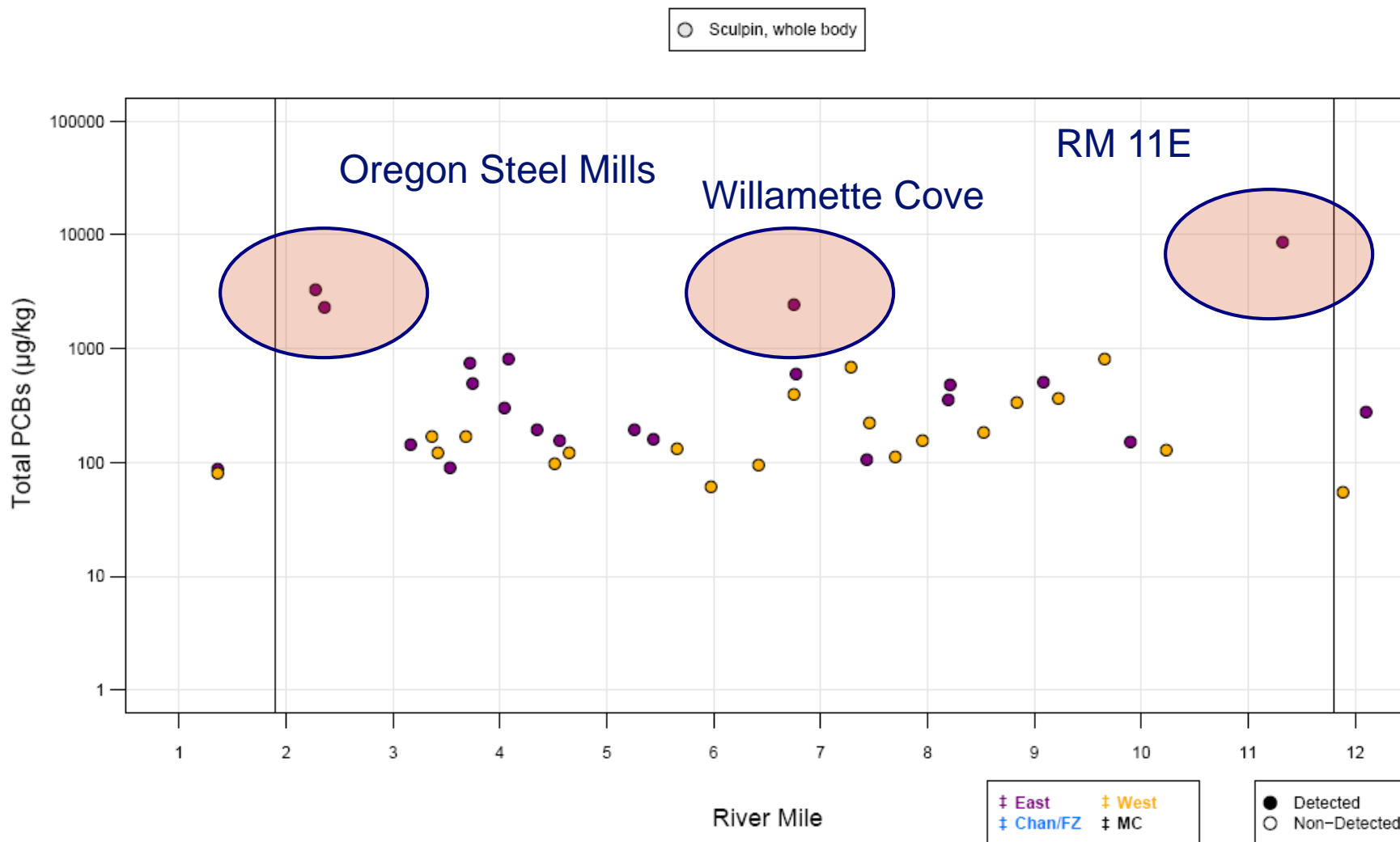
Areas of Benthic Risk



Total PCBs in Smallmouth Bass







Total PCBs in Sculpin



Human Health Risk Assessment

Exposure Scenarios Evaluated

	Ingestion and Dermal Adsorption	In-water Sediment Ingestion and Dermal Adsorption	Surface Water Ingestion and Dermal Adsorption	Groundwater Seeps Ingestion and Dermal Adsorption	Fish/ Shellfish Ingestion	Infant Consumption of Human Milk
Workers						
Transients						
Beach Users						
Fishers						
Divers						
Domestic Users						

Baseline Human Health Risk Assessment Results

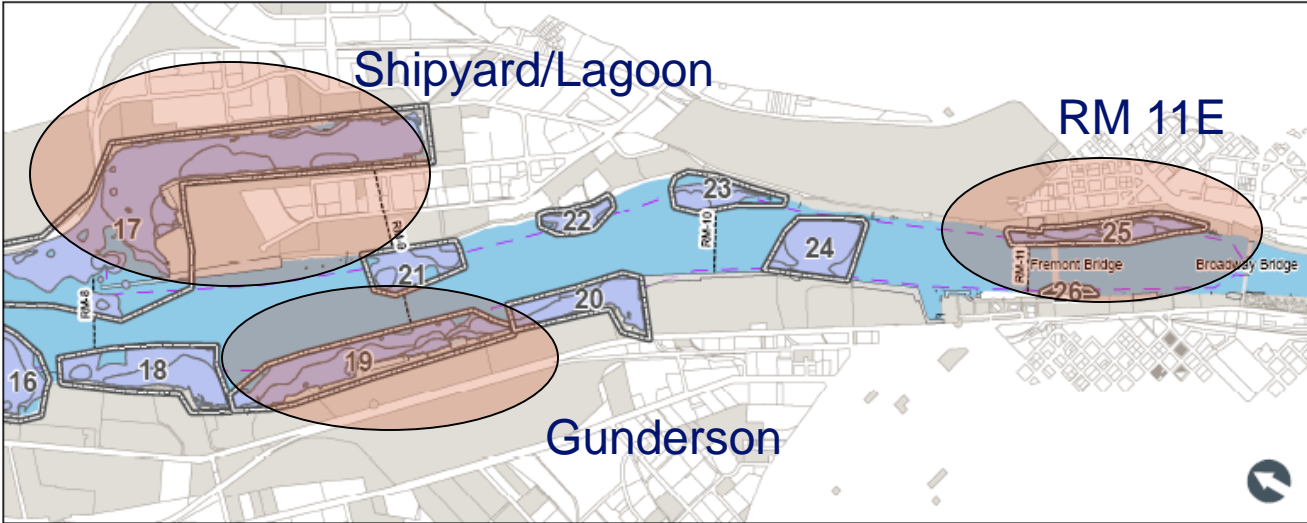
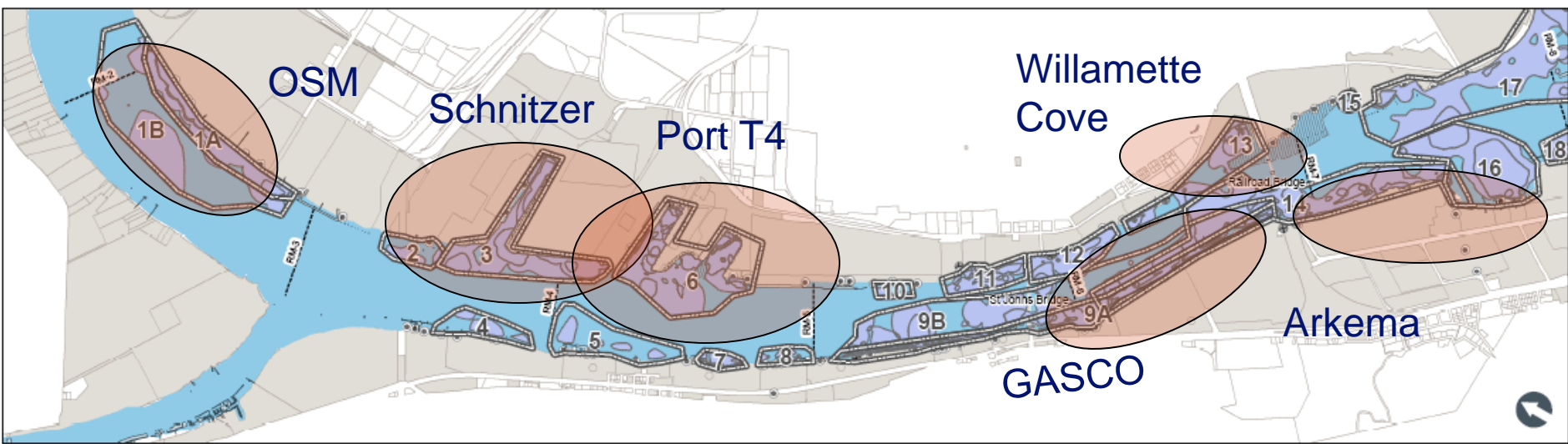
- Greatest risk from consumption of resident fish
- Lower risk through sediment direct contact
- Consumption risks and hazards $> 1 \times 10^{-4}$ and HI of >1 both harbor-wide and river mile scale
- Harbor-wide: PCBs are the primary contributor to risk from fish consumption.
- River Mile Scale: Dioxins/furans are a secondary contributor risk and hazard.
- PCBs are primary contributor to the noncancer hazard to nursing infants, primarily because of the bioaccumulative properties of PCBs and the susceptibility of infants to the developmental effects associated with exposure to PCBs.
- The largest source of uncertainty includes the lack of good site-specific information about consumption of resident fish from Portland Harbor prior to the initiation of fish consumption advisories.

Baseline Ecological Risk Assessment Results

- PCBs, DDx, dioxin and PAHs are most ecologically significant
- Fish— PCBs, DDx, TBT and metals present highest risk to fish and shellfish (tissue residue and dietary)
- Wildlife – PCBs, DDE and dioxin present highest risk to birds and mammals (dietary)
- Benthic Community – toxicity, TBT, metals, PAHs, PCBs, DDX and VOCs (bioassays, generic and site specific SQGs, tissue residue and TZW)

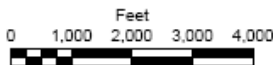
AOPC Identification

- 26 Areas of Potential Concern
 - Fish consumption (PCBs) is the primary risk driver
 - Benthic Risk – Sediment toxicity
 - PAHs – Direct contact and shellfish consumption
 - Organic pesticide, PECD/TCDD
- Secondary COCs
 - BEHP, metals, TBT, TPH, PCP, hexachlorobenzene
- Key sediment source areas:
 - OSM, Schnitzer Steel, Port T4, GASCO, Arkema, Shipyard and Swan Island, Willamette Cove, Gunderson, RM11E
 - Site-wide AOPC based on PCBs and fish consumption



Draft AOPCs for Portland Harbor Site
 June 2009
 River Mile 1.9 to 11.8

- LEGEND**
- LWG AOPCs_revised 080509
 - EPA AOPCs 051409



DRAFT



AOPC DEVELOPMENT NOTES
 AOPCs are based on the mapping of surface sediment chemistry against the following lines of evidence:
 1. Recreational small mouth bass fish consumption preliminary remediation goal (PRG) for total PCBs at a 10-4 cancer risk level using the by-river mile hill topping approach. The PRG equates to 29.54 ug/kg dry weight total PCBs achieved on a Surface-weighted Average Concentration (SWAC) basis by river mile. Use a replacement value equal to the PRG in the hill topping routine.

- 2. Site-wide hilltopping approach that results in a site-wide target SWAC of 17 ug/kg total PCBs, which represents one estimate of background. Use 17 ug/kg as the replacement value in the hill topping routine.
- 3. Tribal fisher direct contact PRG for benzo(a)pyrene at a 10-6 cancer risk; hill topping by direct contact sub areas. This PRG equates to a benzo(a)pyrene concentration of 423.25 ug/kg dry weight. Use a replacement value equal to the PRG in the hill topping routine.
- 4. "Common" Probable Benthic Risk Areas, which are the areas that both EPA and LWG currently agree have benthic risks.

It should be noted that areas outside of the individual AOPCs identified on this figure also pose an unacceptable, although generally lower, risk to human health and the environment throughout the current study area. These areas will be evaluated as part of a site-wide AOPC.
 AOPCs were identified prior to completion of the baseline human health and ecological risk assessments and represent a starting point for the Portland Harbor Feasibility Study (FS). AOPCs may expand or contract based on the consideration of additional site information and the results of the baseline human health and ecological risk assessments.



Draft Feasibility Study

- Draft Feasibility Study submitted by LWG March 30, 2012
- EPA provided initial comments on December 18, 2012
 - EPA letter highlighted major comments
 - Letter and comments on EPA website

Draft Feasibility Study Options

- RALs distinguish alternatives through B thru G
- Eleven alternatives evaluated
 - No Action - A
 - 5 removal focused (dredging) B thru F
 - 5 integrated (still involve significant dredging) B thru F
 - Alternative G was Screened out early and not evaluated
- Removal and integrated include mixed technologies
- Assumes sources will be controlled

Cleanup Methods

Combinations of methods used in different areas of the Site

- Dredging
- Capping
- Treatment – in place or after dredging
- Innovative Technologies
- Monitored Natural Recovery
- Enhanced Monitored Natural Recovery

Remedial Action Levels

Alternative	Portland Harbor RALs (parts per billion)						
	PCB	PAH	DDD	DDE	DDT	Dioxin/ Furans	Benthic Toxicity
A	None	None	None	None	None	None	None
B	1,000	20,000	NA	1,000	NA	NA	No Toxicity in 10 Years
C	750	15,000	NA	1,000	NA	NA	No Toxicity at Year Zero*
D	500	8,000	NA	200	NA	NA	No Toxicity at Year Zero*
E	200	4,000	100	50	150	0.02	No Toxicity at Year Zero*
F	75	1,500	50	20	60	0.01	No Toxicity at Year Zero*
G	50	600	15	10	20	0.005	No Toxicity at Year Zero*

* No toxicity immediately after active remedy completion.

Draft FS Alternatives

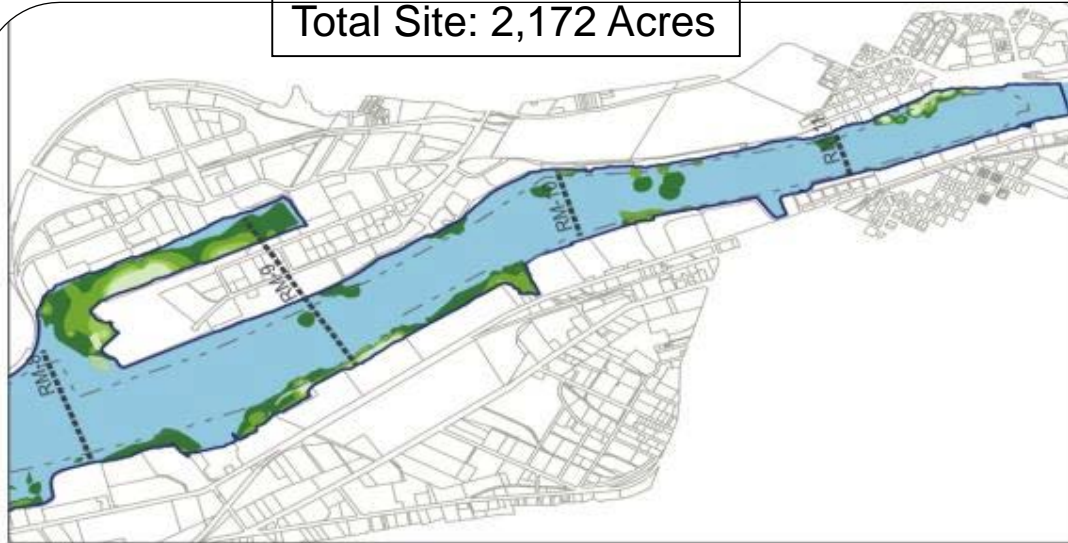
Alternative	Total Dredge Volume Removed	Dredge Areas	In-situ Treatment Areas	Engineered Cap Area	Use of CADs or CDFs ¹	Enhanced Monitored Natural Recovery	Years to Construct	Estimated Net Present Value Cost (\$Millions)	
	(Cubic Yards)	(Acres)	(Acres)	(Acres)				Low ²	High ²
B-i	198,000 to 293,000	23	19	7	None	75	2	\$169	\$250
B-r	541,000 to 783,000	42	0	13	CAD & CDF	41	6	\$228	\$330
C-i	314,000 to 459,000	34	29	13	CAD & CDF	40	3	\$231	\$345
C-r	777,000 to 1,127,000	63	0	10	CDF	73	7	\$304	\$449
D-i	387,000 to 565,000	43	34	15	CAD & CDF	37	3	\$266	\$398
D-r	914,000 to 1,321,000	78	0	13	CDF	68	8	\$351	\$520
E-i	936,000 to 1,362,000	91	58	25	CDF	15	7	\$463	\$709
E-r	1,775,000 to 2,596,000	145	0	21	CDF	15	12	\$568	\$884
F-i	2,129,000 to 3,151,000	176	117	49	CDF	3	15	\$878	\$1,389
F-r	4,196,000 to 6,182,000	304	0	38	CDF	3	28	\$1,077	\$1,762

1 - Confined Aquatic Disposal (CAD), Confined Disposal Facility (CDF)

2 - The cost of the entire duration of the project in today's dollars.

Sediment Cleanup Areas

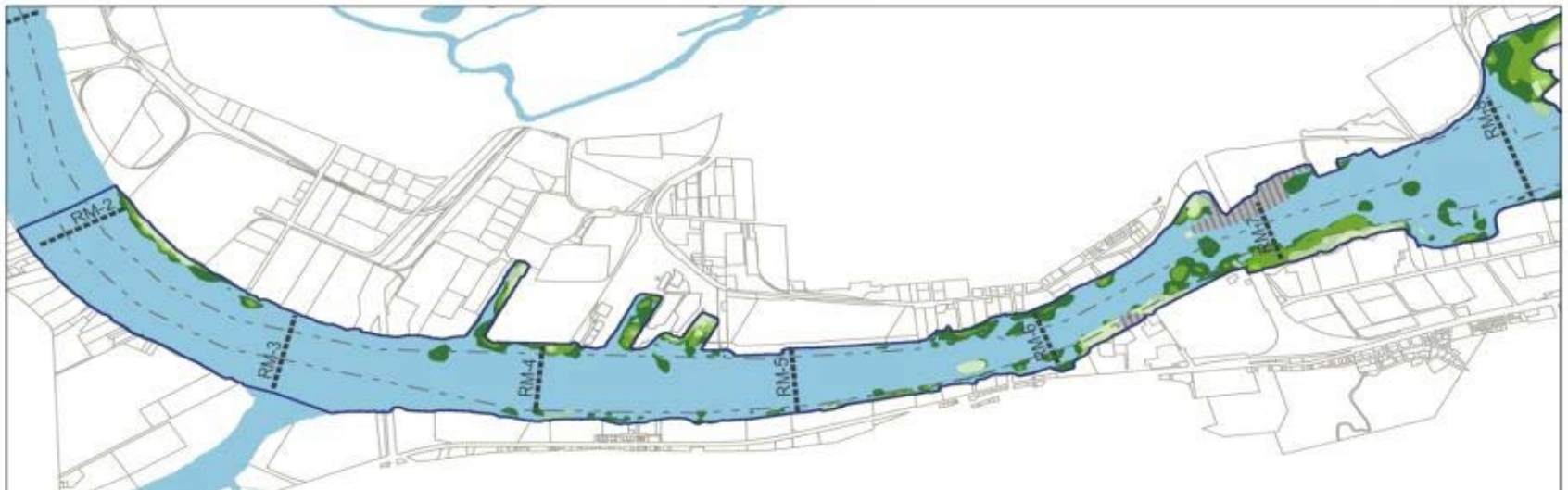
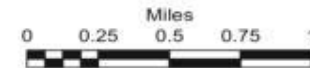
Total Site: 2,172 Acres



LEGEND

- Alternative B - 49 Acres
- Alternative C - 76 Acres
- Alternative D - 95 Acres
- Alternative E - 191 Acres
- Alternative F - 391 Acres
- River miles
- Portland Harbor Study Area
- Tax Lots
- Navigation Channel

Note: EMNR areas are not shown for Alternatives B-F.



Alternatives Evaluation – Empirical Data

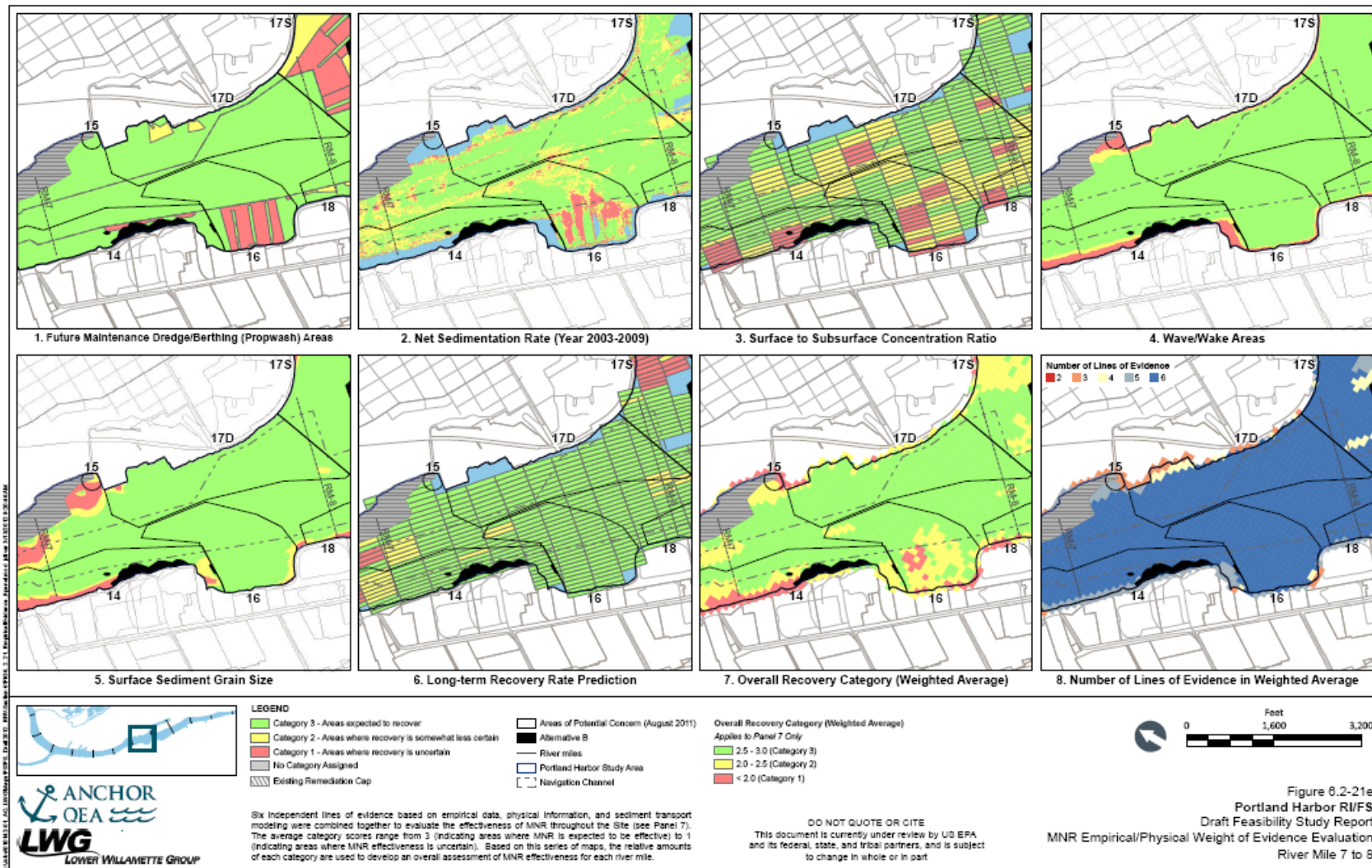
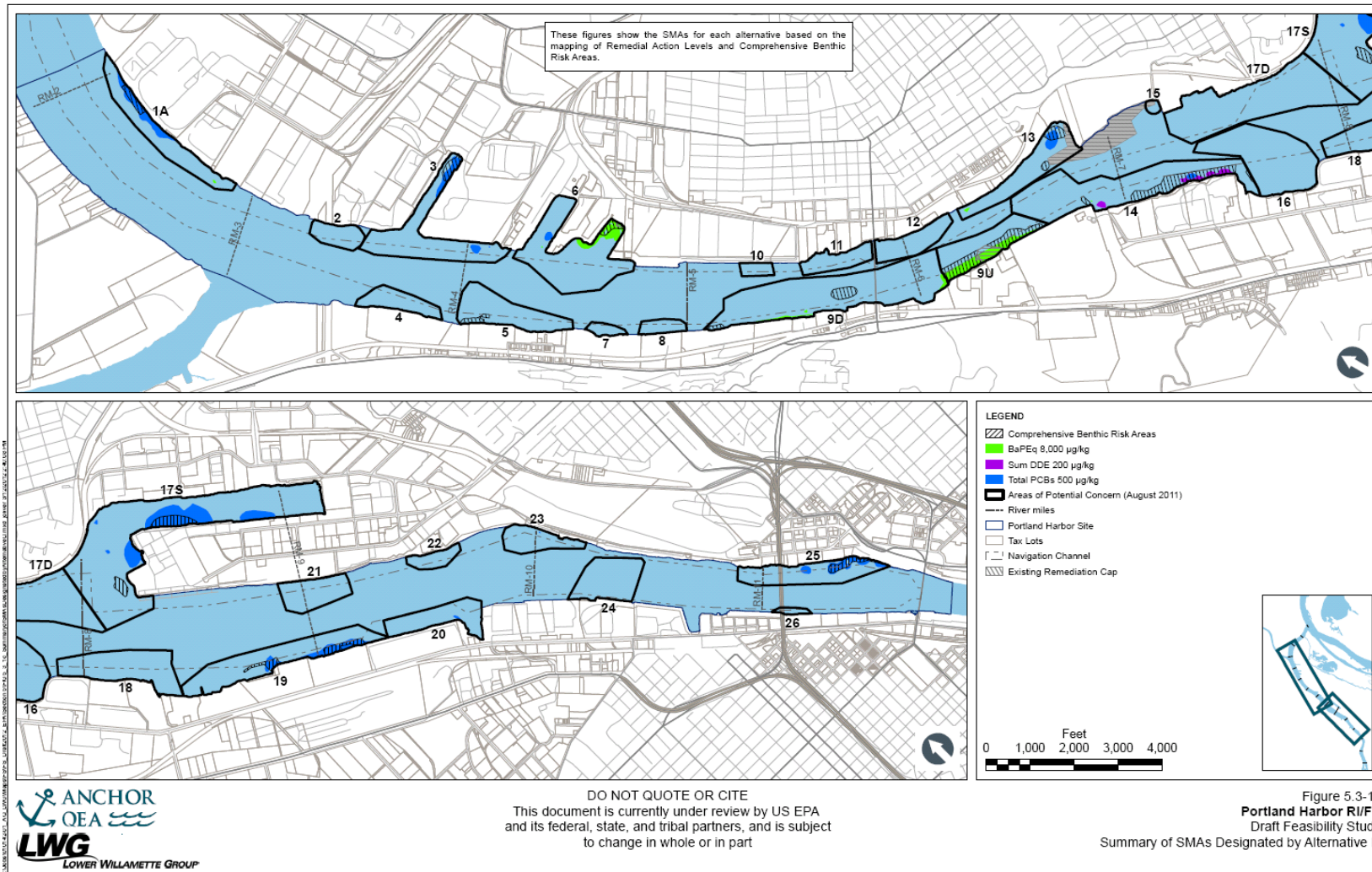
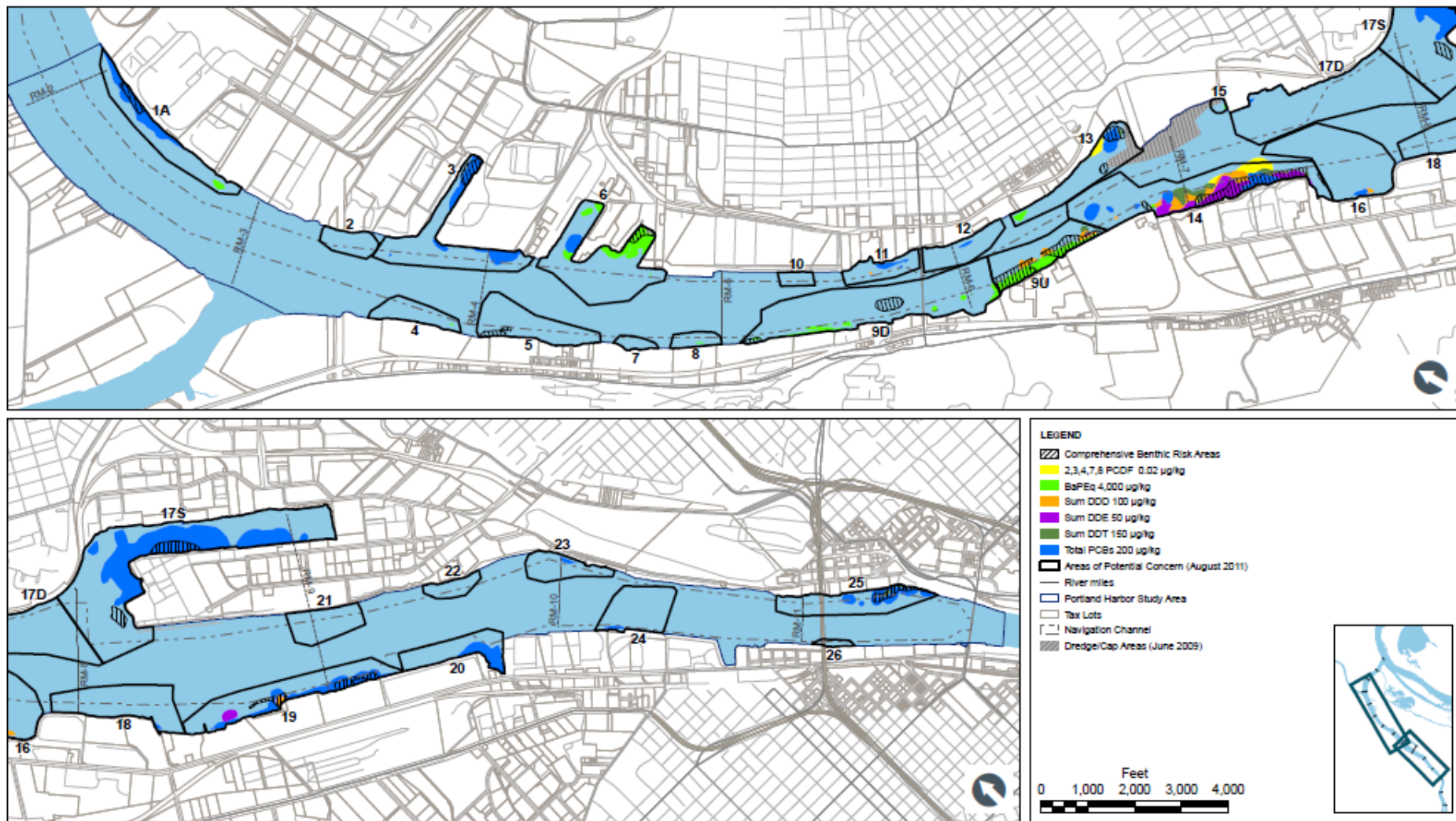


Figure 6.2-21e
Portland Harbor RI/FS
Draft Feasibility Study Report
MNR Empirical/Physical Weight of Evidence Evaluation
River Mile 7 to 8

SMA Mapping- Alt D. Example



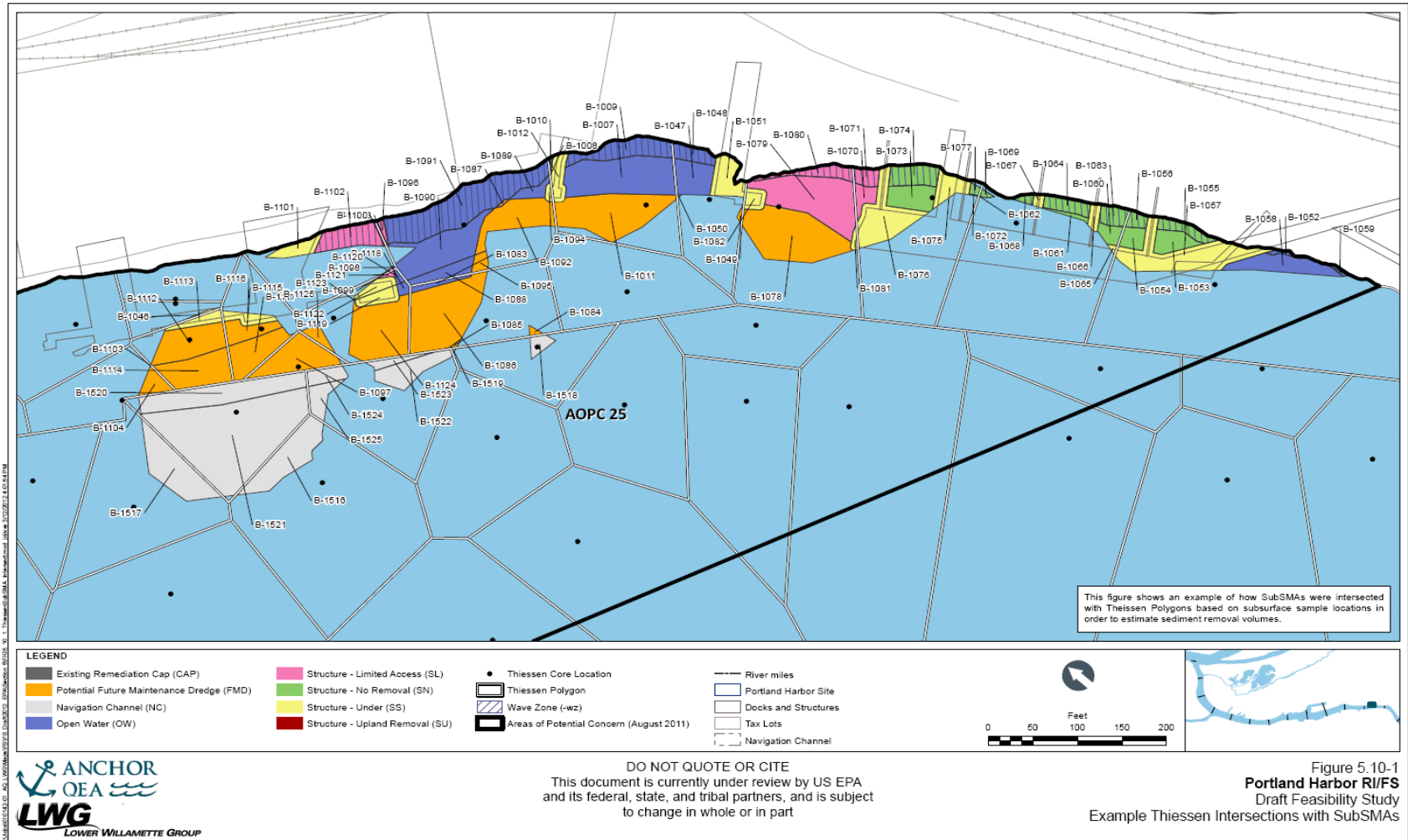
Alternative E



Preliminary Draft Information: Distribution Restricted to EPA Project Team.
Contains Preliminary Analyses Subject to Change in Whole or in Part.

Figure 5.3-1d
Portland Harbor RI/FS
Draft Feasibility Study
Summary of SMAs Designated by Alternative E

Volume Development



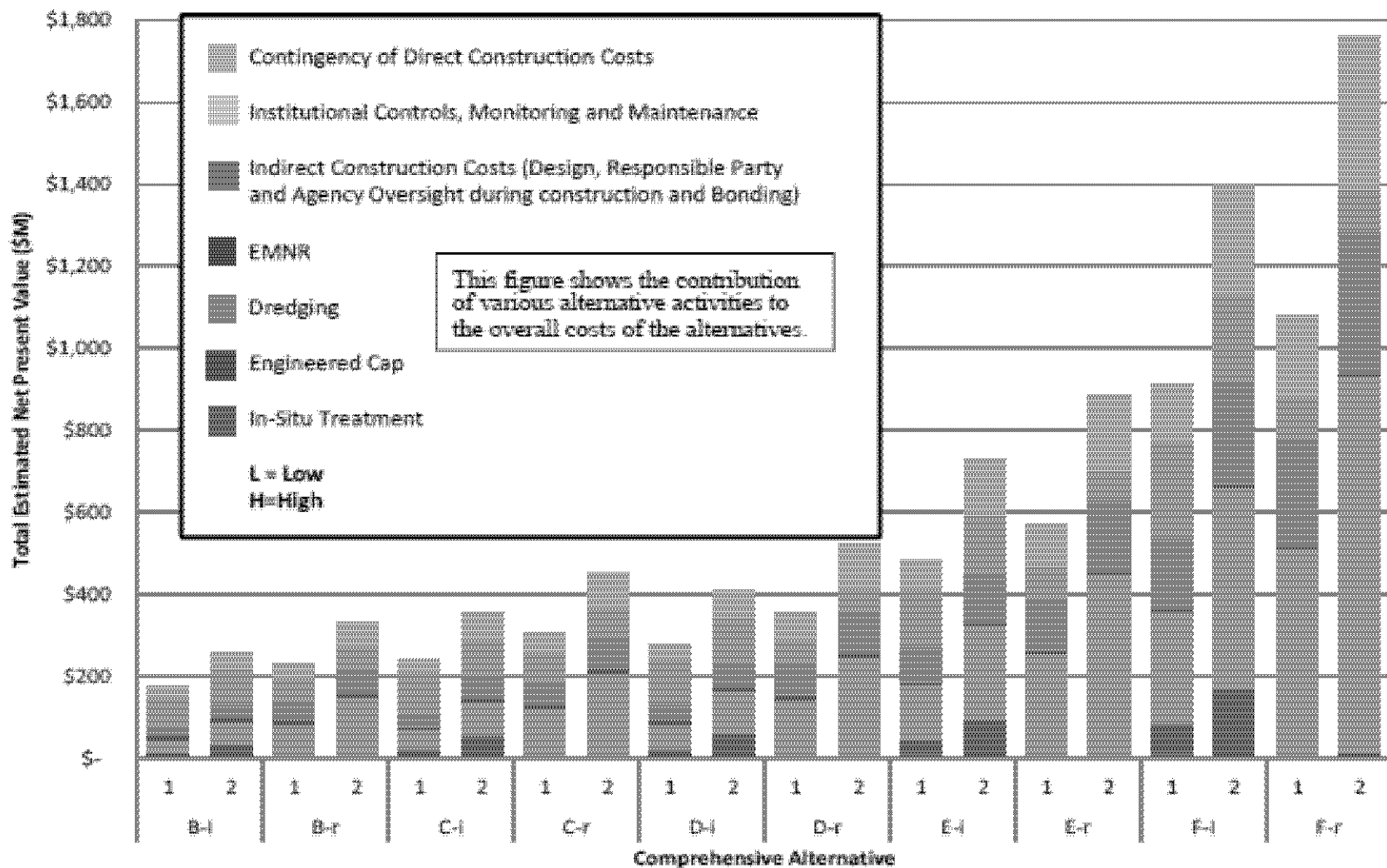
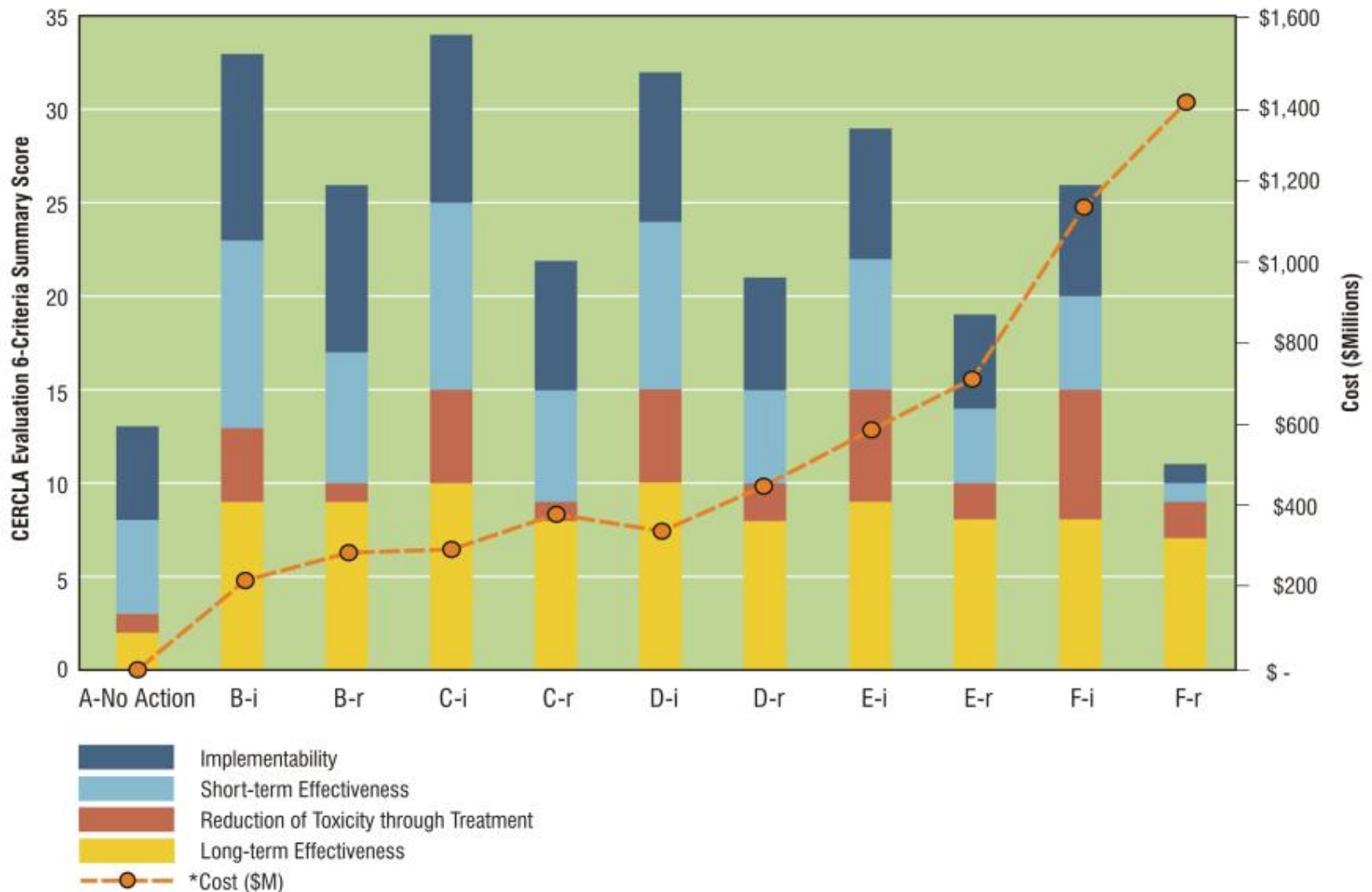


Figure 9.7-2
Portland Harbor RMFS
Draft Feasibility Study
Breakout of Net Present Value Cost by Alternative

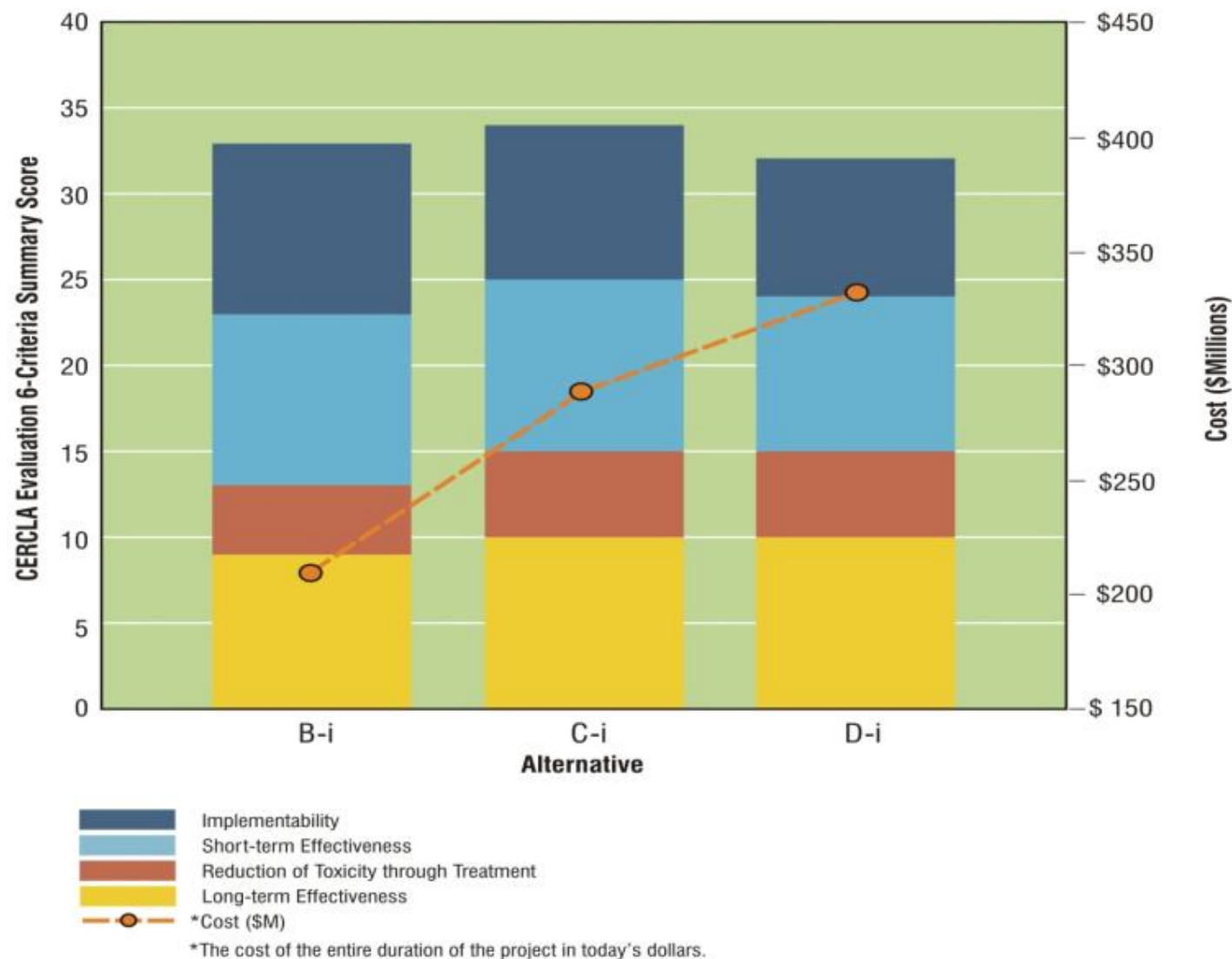
DO NOT QUOTE OR CITE
This document is currently under review
by US EPA and its federal, state, and
tribal partners, and is subject to change
in whole or in part

LWG Alternatives Comparison



*The cost of the entire duration of the project in today's dollars.

LWG Best Scoring Alternatives



LWG Conclusions in Draft FS

- Site is depositional (supports MNA)
- All alternatives adequately reduce risks to human health and environment (except the No Action Alternative)
- Differences - cleanup action levels, active cleanup time, impacts, use of technology, and cost

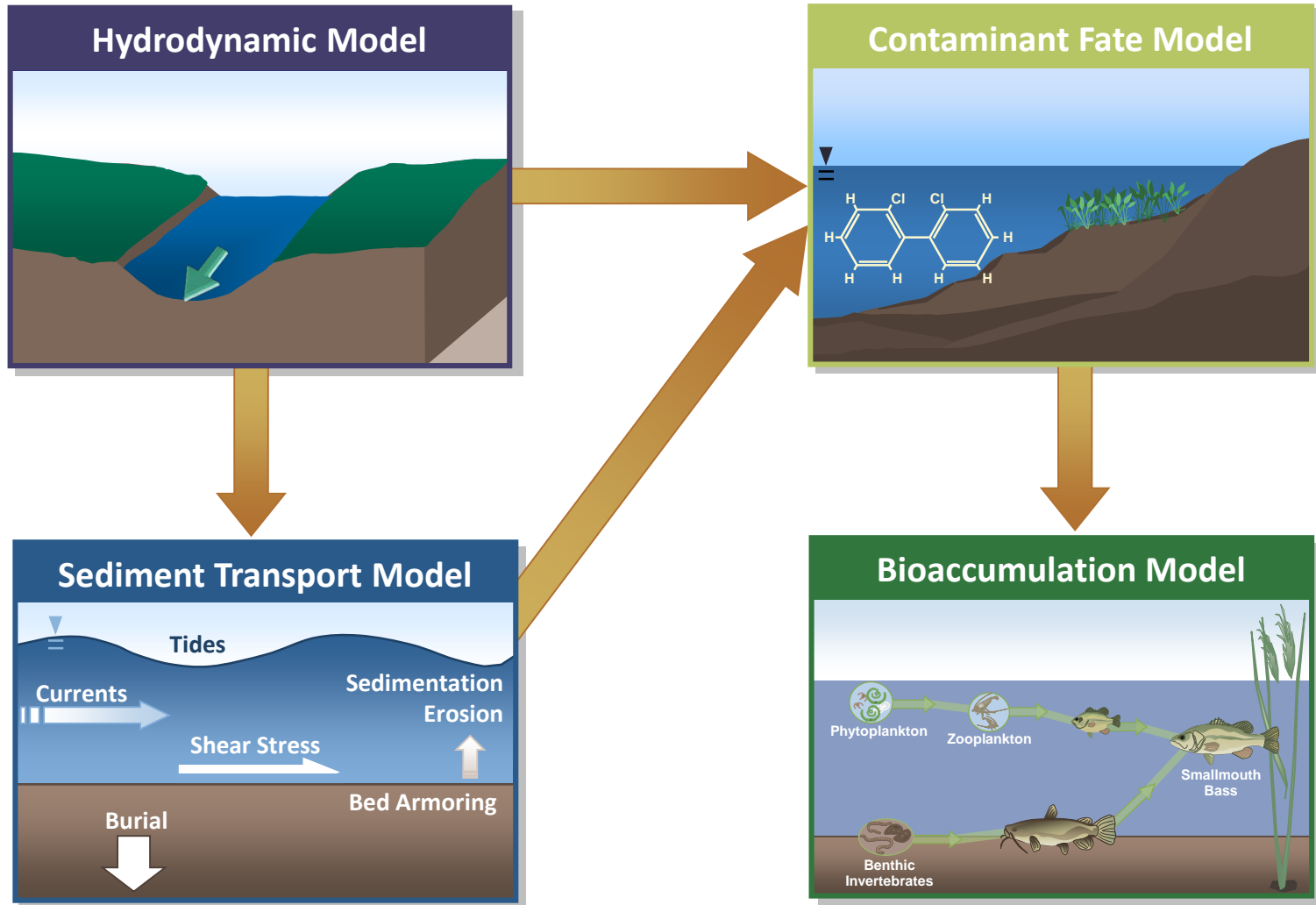
EPA Comments on Draft FS

- Document not approvable
- EPA is performing independent evaluation and comparison of alternatives
- EPA expects to redraft portions of the report with support from LWG
- Working with LWG on process and schedule targeting FS revision by Spring 2014

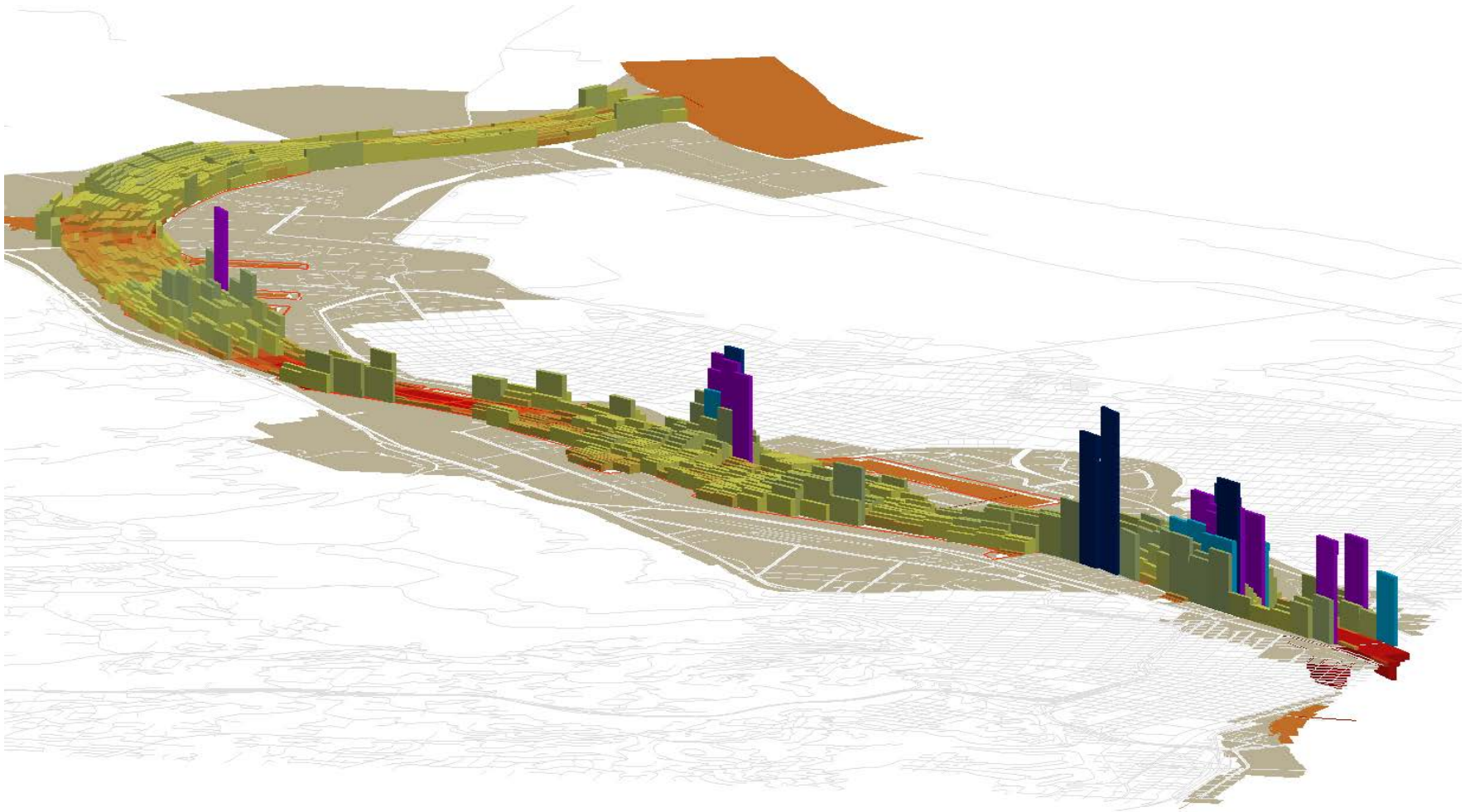
Major Issues – Draft FS

- Monitored Natural Recovery emphasis
 - Fate and transport model predictions of depositional rates for many areas
- Dredging effectiveness and impacts
- Site-wide vs localized focus evaluation
- Short term vs long term impacts
- Appendix E “Sensitivity Analysis”
- Comparative analysis of alternatives
- “packaging” of technologies/alternatives

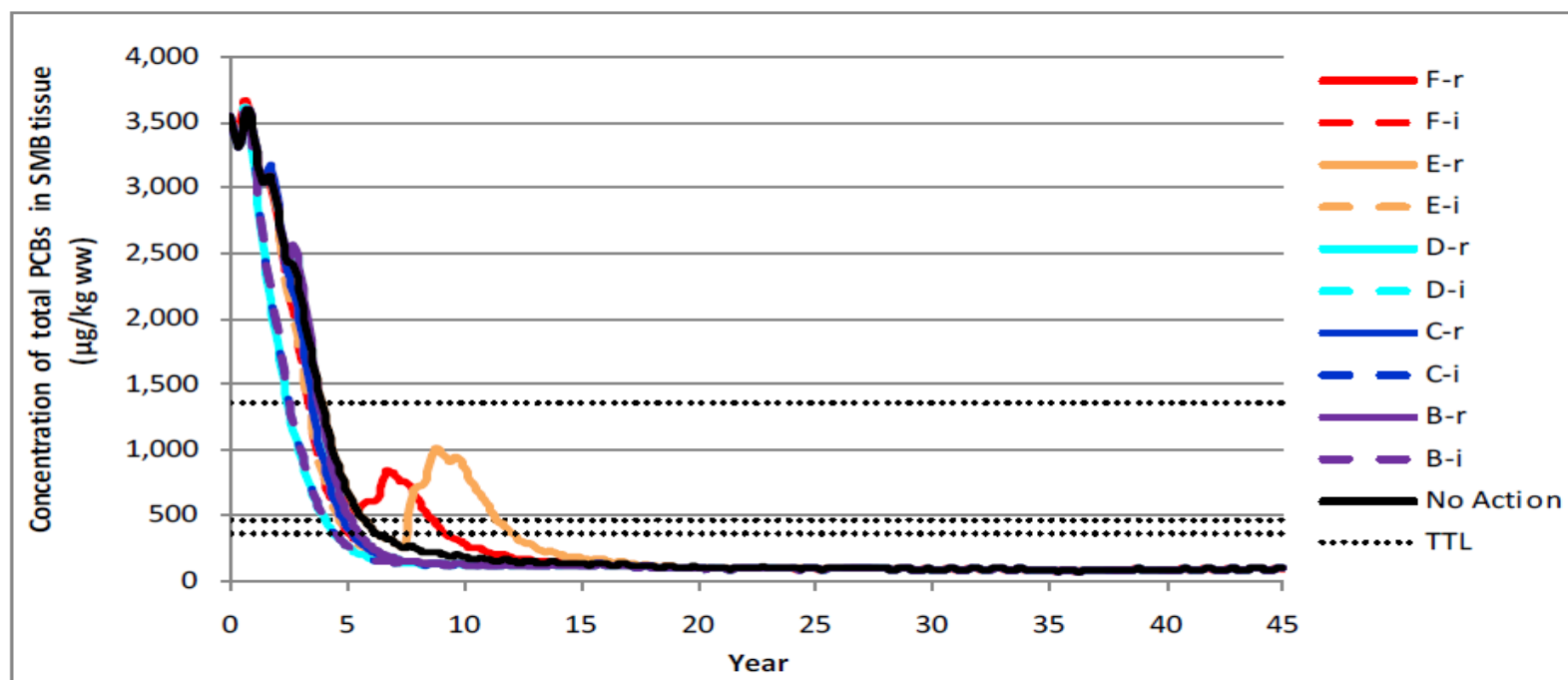
LWG Fate and Transport Model



LWG Model Predictions Deposition and Erosion



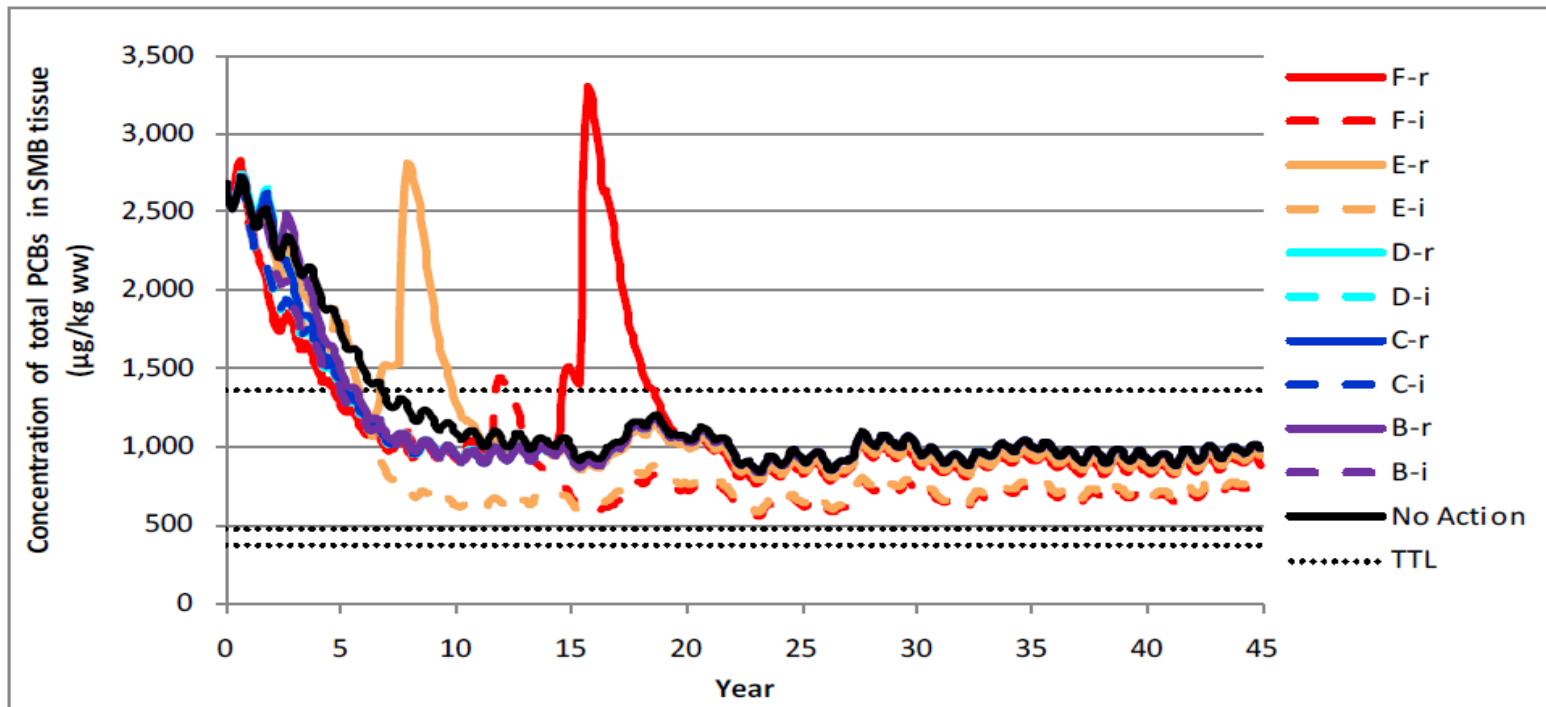
LWG Predicted SMB Tissue at RM 11E



Note: i – integrated, r – removal, SMB – smallmouth bass, TTL – target tissue level

Dotted horizontal lines indicate SMB TTLs for the 10^{-4} excess cancer risk level, corresponding to the 90th percentile (4,140 µg/kg ww), point estimate (1,356 µg/kg ww), 95th percentile (470 µg/kg ww), and 99th percentile (372 µg/kg ww). TTLs are only shown on the graph if they fit within the scale shown.

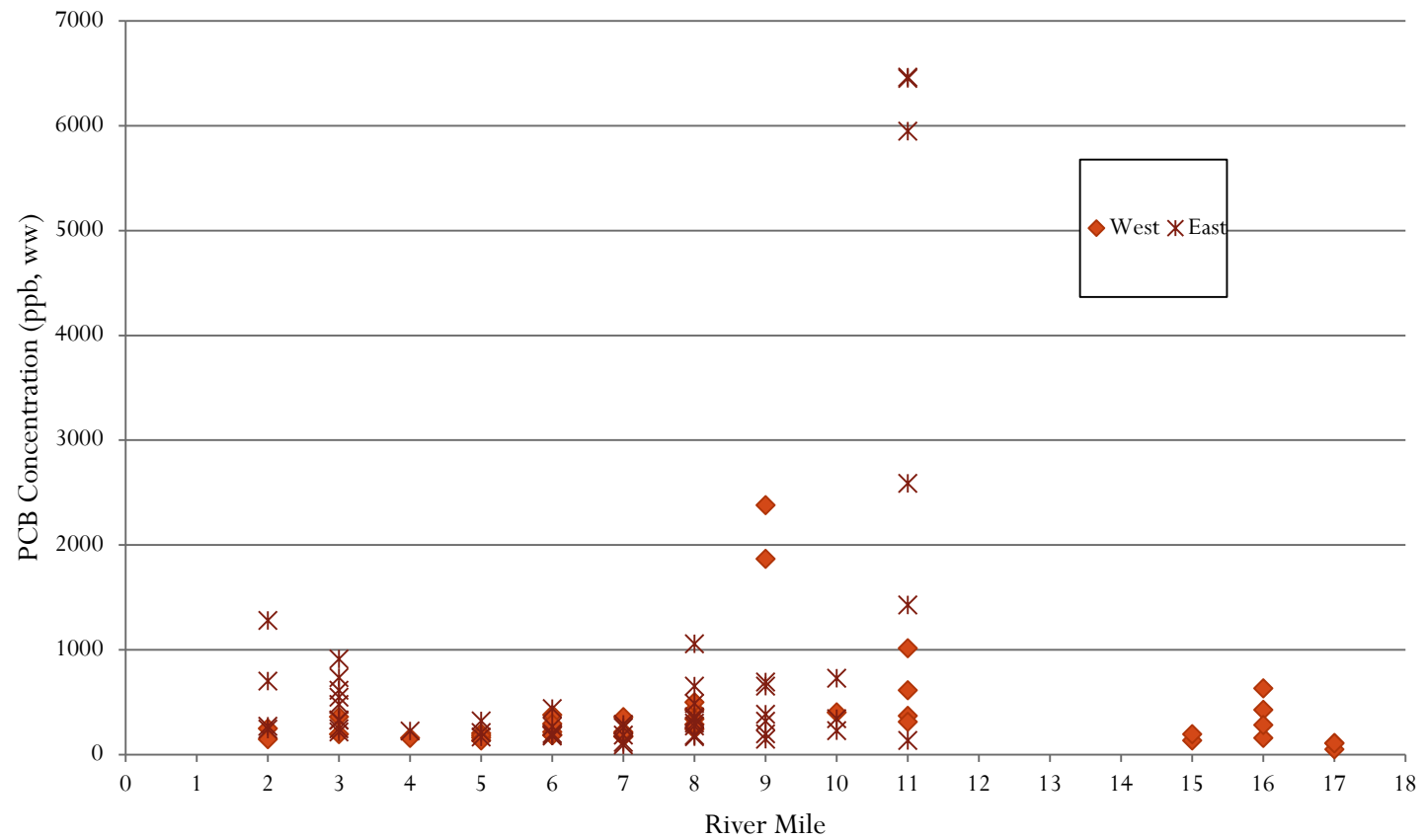
LWG Predicted SMB Tissue RM9-10 (Gunderson)



Note: i – integrated, r – removal-based, SMB – smallmouth bass; TTL – target tissue level

Dotted horizontal lines indicate SMB TTLs for the 10^{-4} excess cancer risk level, corresponding to the 90th percentile (4,140 µg/kg ww), point estimate (1,356 µg/kg ww), 95th percentile (470 µg/kg ww), and 99th percentile (372 µg/kg ww). TTLs are only shown on the graph if they fit within the scale shown.

2012 Smallmouth Bass Whole Body PCBs



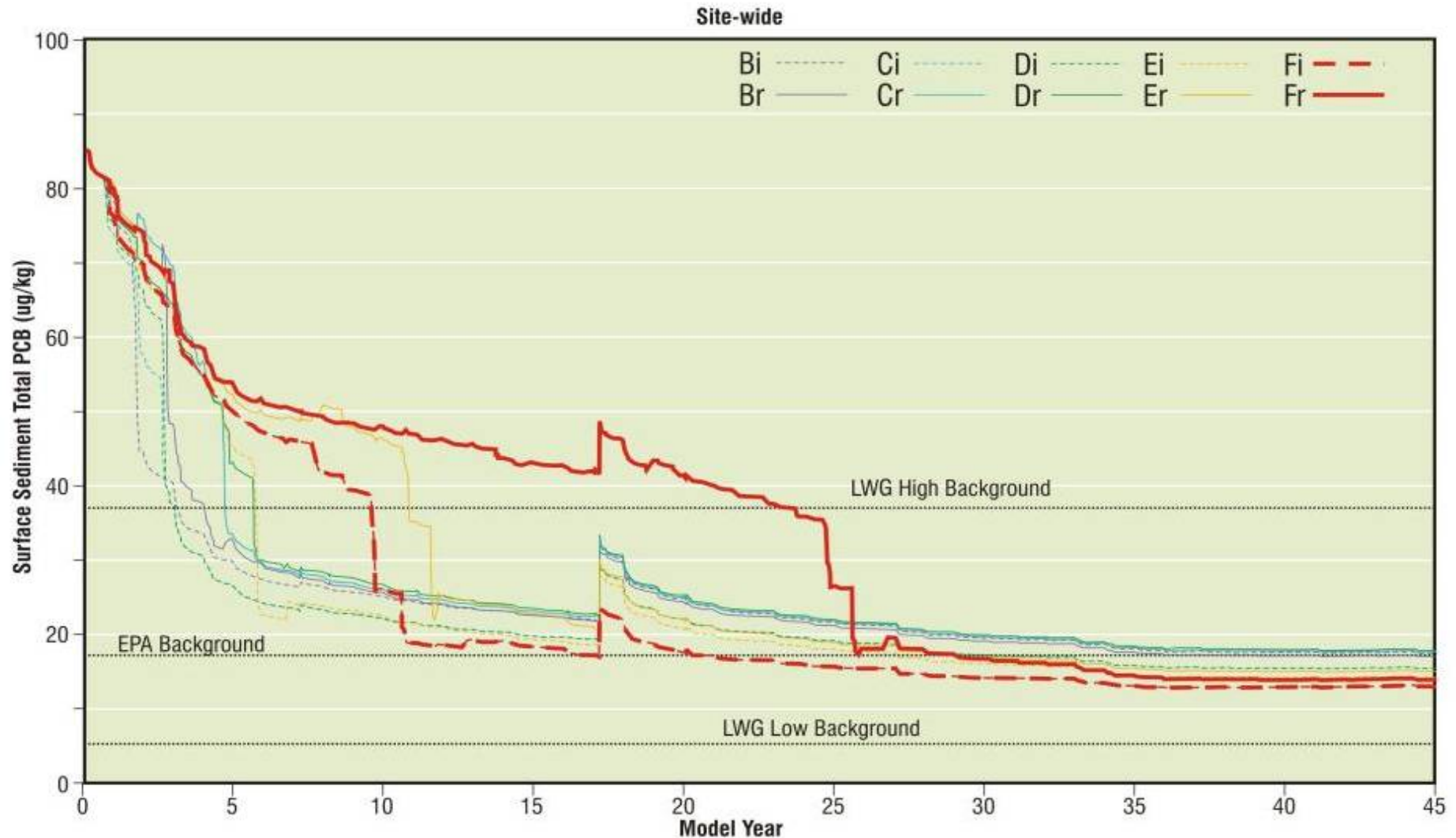
Site-wide vs. Localized Focus

- Many contaminants are in discrete areas, some localized sources in certain sections of the river. Sitewide focus dilutes sources
- Sitewide averaging not consistent with ecological relevance for key species (ie, small mouth bass home ranges)

Dredging Evaluation

- FS Dredging assumptions – releases, residuals, production, project duration and sequencing
- Releases and residuals feed into models
- Corps ERDC review & recommendations
 - Releases – LWG: 3% of contaminants mass (100% soluble); ERDC: 1% with current practices
 - Residuals – LWG 5% of mass in last cut w/ 6” cover
 - Production – LWG: 2100 cy/day (700 cu/day/plant, 3 plants @ 10 to 12 hrs day); ERDC: 5,600 to 6,000

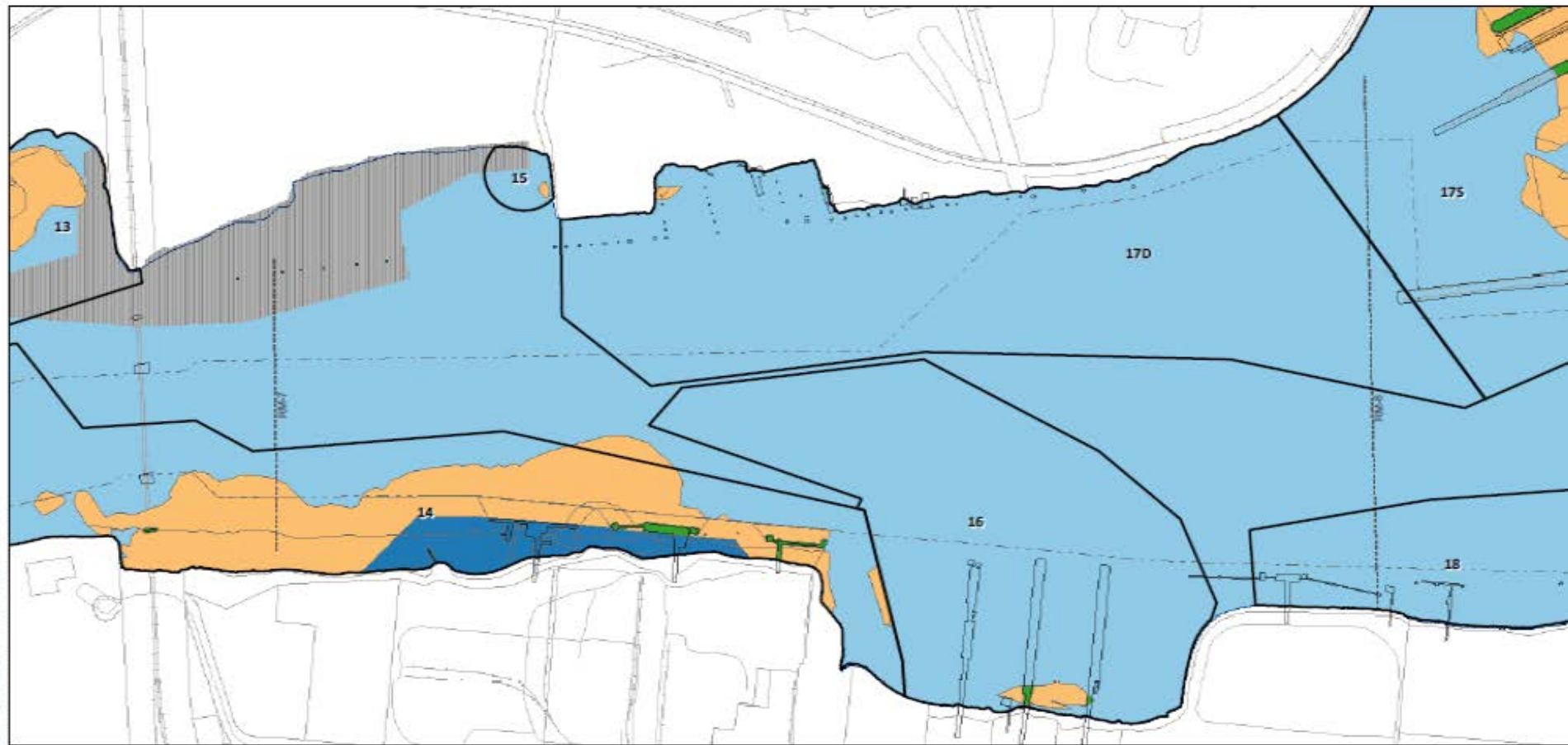
Predicted PCB concentrations



Disposal

- LWG assumed screening CADs and CDFs
- Draft FS includes various CDF combinations for alternatives C through F.
- CDF locations at Arkema, Swan Island Lagoon and T4
- Arkema and Swan Island CDFs conceptual
- T4 CDF — selected for T4 early action, at 60% design
- Local opposition to CDFs

Arkema CDF

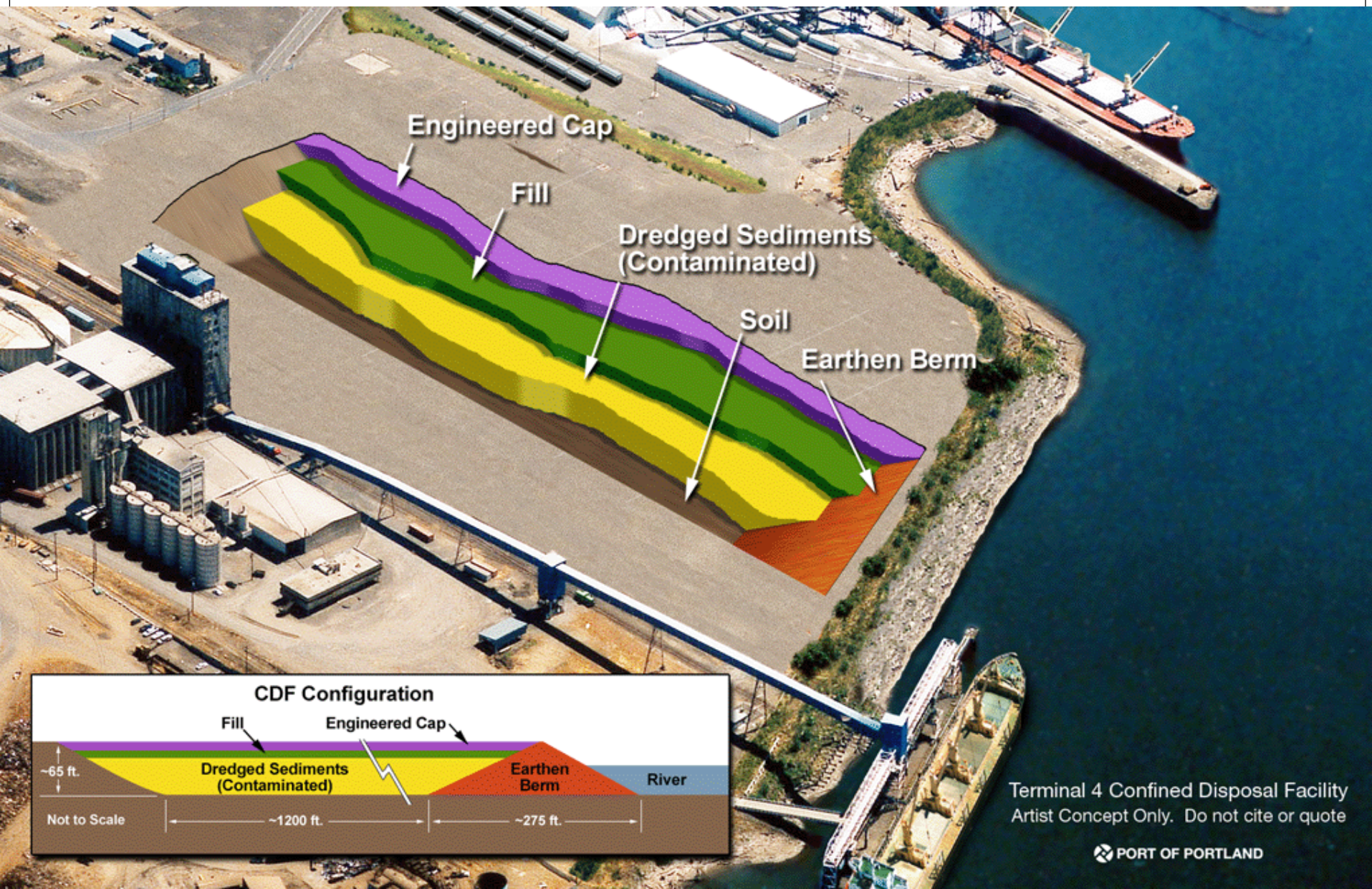


LEGEND

- | | | |
|-----------------------------------|--|----------------------|
| Potential Disposal Site (CAD/CDF) | Areas of Potential Concern (August 2010) | Docks and Structures |
| EMNR | River miles | |
| Engineered Cap | Portland Harbor Study Area | |
| Removal | Tax Lots | |
| | Navigation Channel | |



T4 CDF



EPA review process

- Finalizing PRGs, RALs based on final RAs
- Tech checkpoints/work sessions
- Areas of focus – rolling river miles
- MNR model evaluation – ERDC (Earl Hayter)
- Dredge residuals, releases – ERDC
- Road to ROD

PH – Road to ROD



Draft FS to ROD

- EPA review of Draft FS – 2013
 - Public outreach
 - Adequate basis for remedy selection
 - Comment/revisions/Final FS
- Proposed Plan development
 - Begin drafting based on draft FS
 - R10 peer review
 - NRRB/CSTAG reviews
- Proposed Plan – public comment – 2014
- Record of Decision - 2015

Community Involvement

- Four FS information sessions
- Portland Harbor Community Advisory Group meets monthly
- TAG Grant – Willamette Riverkeeper
- Regular e-mail updates to over 1000 people with information about the investigation and cleanup
- Project team members make presentations to a wide variety of stakeholders and audiences.

Portland Harbor

EPA Contacts/Additional Information

<u>EPA CONTACT</u>	<u>TITLE</u>	<u>PHONE #</u>
Chip Humphrey	RI/FS RPM	(503) 326-2678
Kristine Koch	RI/FS RPM	(206) 553-6705
Sean Sheldrake	Early Action RPM	(206) 553-1220
Rich Muza	Source Control RPM	(503) 326-6554
Lori Cora	Site Attorney	(206) 553-1115
Alanna Conley	Public Affairs Coordinator	(503) 326-6831

<http://www.epa.gov/Region10/PortlandHarbor>